MECHANIX ILLUSTRATED

A FAWCETT MAGAZINE

OCTOBER
15¢

LAND MINESWEEPER
Clears path for invasion troops—See page 42

FULL COLOR: PREVIEW OF PLASTICS SEE PAGE 67

Tough

BUT

OH SO GENTLE

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HOW JOE'S BODY BROUGHT HIM FAME INSTEAD OF SHAME

HEY! QUIT KICKING THAT SAND IN OUR FACES!
THAT MAN IS THE WORST NUISANCE ON THE BEACH
LISTEN HERE, I'D SMASH YOUR FACE···ONLY YOU'RE SO SKINNY YOU MIGHT DRY UP AND BLOW AWAY.
THE BIG BULLY! I'LL GET EVEN SOME DAY
OH DON'T LET IT BOTHER YOU, LITTLE BOY!
DARN IT! I'M SICK AND TIRED OF BEING A SCARECROW! CHARLES ATLAS SAYS HE CAN GIVE ME A REAL BODY. ALL RIGHT! I'LL GAMBLE A STAMP AND GET HIS FREE BOOK!
BOY! IT DIDN'T TAKE ATLAS LONG TO DO THIS FOR ME! WHAT MUSCLES! THAT BULLY WON'T SHOVE ME AROUND AGAIN!
LATER
WHAT! YOU HERE AGAIN? HERE'S SOMETHING I OWE YOU!
OH, JOE! YOU ARE A REAL MAN AFTER ALL!
HERO OF THE BEACH
GOSH! WHAT A BUILD
HE'S ALREADY FAMOUS FOR IT!

Charles Atlas

—actual photo of the man who holds the title, "The World's Most Perfectly Developed Man."

I Can Make YOU A New Man, Too in Only 15 Minutes A Day!

If YOU, like Joe, have a body that others can "push around"—if you're ashamed to strip for sports or a swim—then give me just 15 minutes a day! I'll PROVE you can have a body you'll be proud of, packed with red-blooded vitality! *"Dynamic Tension."* That's the secret! That's how I changed myself from a spindle-shanked, scrawny weakling to winner of the title, "World's Most Perfectly Developed Man."

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CHARLES ATLAS, Dept. 6K
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I want the proof that your system of *"Dynamic Tension"* will help make a New Man of me—give me a healthy, husky body and big muscular development. Send me your free book, "Everlasting Health and Strength."

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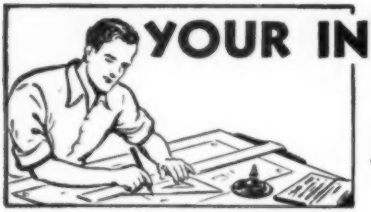

YOUR INVENTION CLINIC

Conducted by

JOSEPH H. KRAUS

Mr. Kraus has been giving advice to inventors for more than 20 years. He will attempt to answer as many letters from inventors as possible in his column each month. Mr. Kraus will "call his shots as he sees them" in this column. Thoroughly versed on inventions and inventions procedure, he will never, under any circumstances, disclose any valuable secrets. He cannot answer questions relating to patent law. For such information, the Editors suggest you communicate with any one of the patent attorneys who advertise in MECHANIX ILLUSTRATED.

Rotary Gasoline Engine

Samuel Hagerman, Carson City, Michigan, says, "I have quite a lot of faith in your patent advice, having read it since the old days. Am sending you an exact copy of drawings I furnished the Government. Here is their letter to me."

ANSWER: *It is difficult for us to see exactly how you expect your four cycle engine to operate. The reason is that the drawings and explanation are not clear enough. A good assembly diagram would be very helpful. Again, in your communication you refer to lettered parts, but you do not letter your diagram.*

Basing our decision, then, not on the practical side, but rather on your statement of having the patterns in readiness for casting and the fact that you have spent so much time and thought on this motor, we would recommend that you discount to a large measure the statement offered by (name omitted) that this motor "shows no sufficient advance over current developments in this field as to warrant further consideration."

In our opinion, the motor does show advance and definitely warrants further consideration.

Having invested a considerable sum of money in this motor, it would pay you to invest a few more dollars. Get up a good set of drawings. Have a patent search made. If the coast for eventual patenting appears clear, do not apply for a patent immediately, but instead build a model and test out the engine. If the test proves successful, then apply for a patent and attempt to introduce this motor on the market. Here you will have some difficulty. We would recommend that you try the outboard motor field first. This offers the greatest possibilities on a small scale. Flexibility and low speeds possible with such a perfect motor would be ideal in this field.

We wish you all the luck in the world, but caution you against unequal wearing of parts, which we believe this construction entails.

Ventilated Toilet Bowl

C. J. Parsons, CRM, USN, c/o Fleet Post Office, San Francisco, Cal., outlines a plan for producing a ventilated toilet bowl.

ANSWER: *Your suggestion for a ventilated toilet bowl has been made before. How far any of these previous designers have gone toward patenting their suggestions could be learned only by having your attorney institute a patent search.*

There are several drawbacks to the suggestion. How drafty will the equipment be when in operation? Will it create enough vacuum so that thin clothes would be sucked into the bowl? If not, how do you propose to control the vacuum so that there will be a sufficient release of air when the seat bowl is sealed quite effectively, and also displace a sufficient quantity of air when a rather large area remains uncovered? Again, how would you protect against fine particles of moisture and solid matter getting into the area of the fan and gumming it up? And how about cleaning the parts?

Your suggestion for the mechanical system for creating the vacuum is based on an old principle. We are not disclosing it here for your own protection. But we would like to inquire as to when and how you are going to set the mechanism in operation?

You see the problem is not quite as simple as you outlined. Finally, there is the matter of public acceptance. Undoubtedly, most people would like such an arrangement if it is fool-proof and requires no more attention than modern bathroom plumbing.

And while we are on this subject, let us digress for just a moment. The most unsanitary portion of the body is the area of excretion. Nevertheless, although you wash your face and hands with soap and water, and you brush your teeth and wash your mouth with antiseptic solution, you merely wipe away the aforesaid area. Now, there is a toilet seat which automatically shoots a stream of water to cleanse the area, but it has not become too popular, and you can well imagine why not. The ventilated toilet bowl which you recommend might fare in a similar fashion; so you must be careful to introduce no objectionable features regardless of how valuable they might be from an idealistic viewpoint.

We would recommend that you have a search made first. See if there is a reasonable assurance of protecting the design.

INVENTORS

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CHIPS *from the* EDITOR'S WORKBENCH

A New Kind of Photo Contest

Now that Kodachrome and the new Ansco Color film are again available to the general public, we know that many MI readers who are interested in amateur photography will want to enter the big color photography contest announced opposite page 35 of this issue. Aside from the fact that it offers you a chance to have your favorite color "negative" (transparency) or print reproduced in four-color rotogravure, the contest carries with it three nice cash awards—starting with one hundred poon (dollars to you)—but turn to the announcement and read the rules and all details for yourself.

Who Got There First?

A lot of people have the impression that the Germans came up with something brand new in their channel-crossing pilotless plane. The Germans themselves have carefully nourished this misconception with claims that their robot plane is a real "first" for the Vaterland. Actually, American engineers pioneered this whole new development years ago—it remained for the Nazis to exploit its destructive power. Just one week before the armistice of World War I, the United States tested a gyroscopically-steered flying bomb that hit targets after flights up to 35 miles. Dr. Thomas Midgley, Jr., the engineer who more recently invented tetra-ethyl lead for anti-knock gasoline and refrigeration chemicals, had a hand in those first experiments.

The bomb-carrying device of the last war was a small, unmanned airplane, powered with a four-cylinder air-cooled V-type engine, giving 40 horsepower for about 45 pounds weight. It carried a 50-pound bomb. When the first test flight was made at South Field, Dayton, Ohio, good results were obtained after engineers developed the know-how to cope with their strange new baby. "There was no great lack of accuracy," Dr. Midgley says, "but you couldn't get an old line artillery officer to admit it." The idea was Elmer Sperry's (of Sperry gyroscope fame), but the development was handed over to Dr. C. F. Kettering, who is now in charge of General Motors research and chairman of the National Inventors Council. Orville Wright was chief consultant on the project.

The aerial-torpedo idea was quickly dropped, although it had been demonstrated to be completely feasible. Apparently the methodical Germans simply took up where we left off.

NEXT MONTH:

The Puppet's Pal:

Oden and Olivia Meeker, talented newcomers to MI, tell the story of George Pal, pioneer in the field of animated movie shorts, whose Paramount Puppetoons have probably delighted you at your neighborhood theater. This nine-page feature, which reveals the technique of using three-dimensional puppets instead of drawings in making these films, is illustrated in full color.

The Future of the Robot Plane:

Germany's V-1 pilotless planes are making headlines today as they bombard London. In this article Willy Ley, authority on the subject and author of the new book "Rockets," analyzes this device and discusses possible peacetime applications of its propulsion principle.

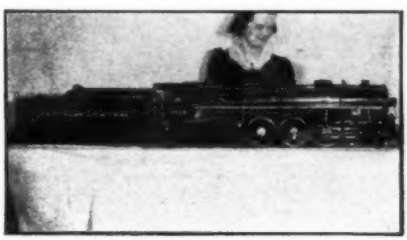
Strongman of Fluorochemistry:

Jack Andrew De Ment, who wasn't old enough to vote in the last presidential election, is famed today as the man who gave the field of fluorochemistry its name and formulated two of its basic laws. In addition, he's a champ weight-lifter! Here's the exciting story of this youthful prodigy.

Raise Your Own Silk:

It can be done! In this story of John Ousta, Turkish-born student of silkworm culture, Louis

[*Continued on page* 34]



MODEL LOCOMOTIVE

This model is one of the best we have seen in a long time. It weighs 250 lbs., carries 150 lbs. of steam and will pull a ½-ton load. Only precision parts were used in its construction. Time to build: seven years. Mr. Roderick Davy of Ontario, Canada, certainly has earned a $5.00 Workbench award and a Certificate of Merit.

SPECIAL TELESCOPE OFFER!

Here is the most remarkable offer that we have ever made. Now you can see most everything you want to see! Now you can bring distant objects so clearly close to your eye that they will seem almost near enough to touch. Why feel frustrated and baffled by something far away that you want to see in full detail. Why be limited in your vision when you can multiply it 13 to 15 times with the amazing super-powered lenses in this GIANT telescope. Quickly overcome the handicap of distance . . . the magnification does it like magic. This new telescopic invention is a miracle of mass production economy and engineering ingenuity. Made of available war-time materials, it is the equal in performance of telescopes that sell for as much as $15.00. Think of the wonderful fun you can have by extending your vision 30 miles in full, clear detail. Read on for full explanation of this really remarkable invention.

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and this FREE CARRYING CASE!

This beautiful, military-looking carrying case is yours absolutely FREE with this offer. It is made of heavy canvas that fits over the telescope, making it easy to carry, and protects it from dust, dirt and rain. It fastens at the top by a drawstring, and can be secured easily and comfortably around your wrist. Carrying case is absolutely FREE with this offer so send the coupon today.

The GIANT SUPER-TELESCOPE has several precision-ground highly polished lenses. It extends to 4 feet in length, giving clear focus. It is light in weight, sturdily and handsomely constructed, with a wide magnification field. You don't have to know anything about telescopes to use it. Simply hold it to your eye, extend barrel, and all the wonders of scientific vision will be close up to your eyes. Because of mass production economies, we offer this telescope at an unbelievably low price. See birds, ball games, sporting events, beauties on the beach, ships and planes, in full detail. See people when they cannot see you. See wild life, mountains, the heavens in their full natural beautiful detail. The price of the GIANT SUPER-POWERED TELESCOPE is $2.98 with this introductory offer. Most telescopes of this lense construction and size sell up to $15.00. We cannot assure you that the supply will last so you must act fast!

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☐ Send C.O.D. I will pay postman $2.98 plus new C.O.D. and postage charges on arrival. (Same money back guarantee as above).

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Editor's Workbench Chips

[*Continued from page* 14]

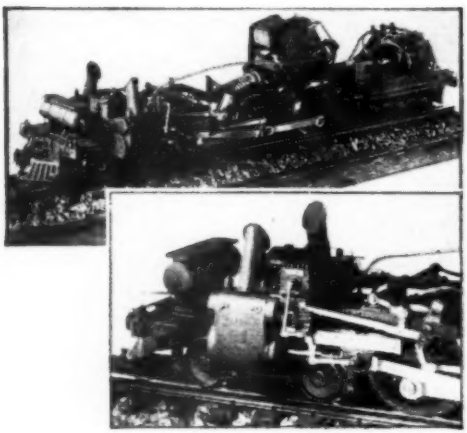
Hochman shows you how we can produce every last yard of silk we need, right in our own back yards.

Sliver

Plans and instructions for building a sturdy, 10-ft. V-bottom dinghy for rowing or outboard use. Designed by William F. Crosby, designer of the *Snipe, Mallard, National One-Design* and many others.

"Buildwords" Contest

Some of this year's contestants have been trying to duplicate R. Davis' prize-winning entry, just for their own satisfaction, and have run into trouble, because errors crept into last month's listing of his words. Perhaps this will help them: In puzzle No. 1, LEVEL was used in the plural (P.LXXX, Section 18), ANNWN once in the singular, once in the plural, and NYN was used twice. In No. 2, SISI was used twice in the plural, once in the singular, and SIS was used once. In No. 3 EPPEL was used twice.



MI's Model Railroader

Fred Ripperda, MI staff artist, is one of the country's most ardent model railroad bugs, and he knows how to build 'em as well as run 'em. You've seen many of his excellent illustrations in the pages of MI; now we give you a look at the latest product of his model railroad workshop—a locomotive chassis that took him 300 hours to complete, so perfect in every respect is its detail and faithfulness to scale. Completion of the entire locomotive will take at least another 200 hours of work. Fred calls it an O-Gauge Freelance 4-6-6 Tank Locomotive.

The idea behind this locomotive was to see how many correct details can be incorporated in such a small scale model. The only castings used in the chassis are the pilot, the wheels, the rear truck and part of the cylinder block. The rest is entirely built-up. The rear truck is a modified Lionel tender truck. It has a complete brake rigging with two brake shoes to each wheel. The lead truck has 64 separate parts not including the wheels and the axles. All rods have brass bushings and the valve gear rods are properly forked. The plate with "valve oil" on the chemical lubricator is a "positive" zinc cut. The locomotive is a 2-rail job and is wired for both AC and DC current.

BOOK REVIEW

FUN WITH A MODEL RAILROAD

By Lawrence W. Sagle

This book by one of the greatest authorities on Model Railroading in America should be read carefully before starting any construction work. It explains in a humorous and clear way the various points that will make a model railroad a success or a failure. The publication is a good introduction to the

BOOK OF RULES FOR MODEL RAILROADERS

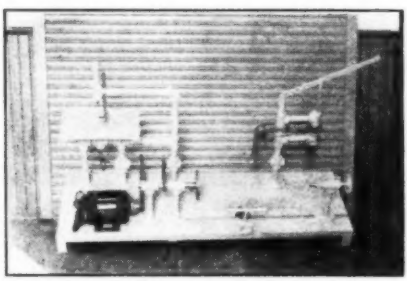
by the same author

It is a well-known and often mentioned fact that just "running trains" from nowhere to nowhere, without any plan, will give no satisfaction.

A model railroad is not a toy layout but a scale replica of the real thing. The operation of this miniature railroad is just as important as a correct motive power, rolling stock and scenery.

The Book of Rules makes it possible for model railroaders to create an activity that fits the size and character of their road.

Published by: Model Craftsman Publishing Corp., Ramsey, N. J.



WORKSHOP UNIT FROM PIPE

From ideas in MI, some pipe fittings and a little imagination comes this compact unit of scroll saw, drill press and woodworking lathe, mounted on a 20" x 60" hardwood board. It is powered by a ½-h.p. motor, and its creator, Mr. J. G. Parenteau of Quebec, Canada, says it's a swell performer. He deserves a $3.00 Workbench award and a Certificate of Merit for his work.

"Sgt. Horton directed the crew in putting out the fire, using not only the standard extinguishers but also cans of fruit juice when the fire threatened to get completely out of control."

DRAMA IN THE SKIES

by Louis Hochman

Our airmen come through some pretty close shaves. Their on-the-spot improvisations aren't in the rule book but they seem to do the trick.

DAY in and day out thousands of planes shuttle across to the enemy's stronghold, deposit their lethal cargo of bombs, blockbusters, and incendiaries—then return home and report on the successful completion of their missions. Simple? Not by a long shot! For Fate plays queer hands in the skies, giving airmen some of the most fantastic experiences of their lives.

Take the case of Staff Sgt. Wilbert E. Gilmore, for instance. There he was in his cozy top turret of a B-24 Liberator, minding his own business (of shooting down German opposition), when the concussion of a direct hit hurled him through the open flight deck floor, *sans* chute, just as the Liberator was making its bomb run over the target. Apparently destined to follow close in the wake of the bombload, he was relieved to feel the strong hands of Staff Sgt. Joseph S. Knight, who had left his post to check the bomb bay doors, close on his leg and check his flight when he was a third of the way down into the bomb bay opening. "Where do you think you're going, sergeant?" asked Knight.

"Nowhere—now—thank God," gasped Gilmore.

Although it is said that lightning never strikes in the same place twice, Sgt. Gilmore is meditating sewing his parachute to the seat of his pants, just in case.

Then there is the case of Sgt. John M. Webb, envy of every dare-devil Hollywood cowboy. When upon nearing its base, his Flying Fortress caught fire, he bailed out, to land several thousand feet later on the back of a horse.

"I yelled like hell at the horse," he said, "but the darn critter kept right on chewing grass." The horse did perk up, however, when Webb landed astride him, and promptly deposited the sergeant on the ground for which he was headed in the first place.

Sgt. James A. Raley, Kentucky farm youth, also had a landing experience which is out of this world. He fell 19,000 feet in the severed tail section of a B-17, landed in a tree, and only cut his chin. It happened on his 13th mission, too. A "hell of a jolt" knocked him flat on his face in the plane and he thought it was all over because there was no chance

"Sgt. John Webb, envy of every Hollywood cowboy, bailed out of his flaming Flying Fort—to make a perfect three-point landing on a horse's back."

to get out. Looking back, he saw a B-17 going down in flames and thought his might have collided with it; but it was the forward section of his own plane—as he discovered later, when after crashing into a tree which cushioned the impact, he emerged to find that except the 12 foot of length of the tail section he was in, no other part of the plane was in sight.

One established fact about our fighting planes is that they are good. In fact, they are so good that they often refuse to give up even after their crews have thrown in the towel and bailed out. The Flying Fortress "We'll Never Know," was one of these. Shot out of commission, she was abandoned by her crew, but on automatic control kept right on flying in formation. Later, when she was about a mile out of formation, German pilots eager for a kill and unaware that the Fortress was a "ghost" plane kept swarming in, one after another, pumping precious ammunition into her. "We'll Never Know" chugged along bravely on her own, ignoring the fighters, and finally crashed a bare ten miles from her home base.

Not all "ghost" planes, however, join as co-operatively in the war effort. "Heavenly Days," a B-24 Liberator, gave its British allies 90 minutes of excitement and worry when crewless, but not bombless, it kept right on flying over England. The bomber, piloted by First Lieut. Richard J. Pettite, developed engine trouble after taking off for a mission over northern France.

He immediately started circling back for a landing, but at 4,000 feet two more engines conked out. The vibration threatened to tear the ship apart, so after trimming it for level flight and pointing its nose out to sea. Pettite and his crew bailed out. Bomb-filled, the plane wheeled in a gentle bank, and headed back over the coast of England.

Two puzzled Spitfire pilots, sent up to investigate, flew a lonely escort, not knowing if any of the crew were still aboard. Relief from their dilemma came eventually when, one by one, crew members who had bailed out landed and telephoned their base. When the final returns were in, the Spitfire pilots were ordered to shoot the Liberator down, which they did after it wandered out over the sea.

The daring and ingenuity of American fliers has been instrumental in saving more than one plane in the heat of battle. When a shell explosion in the hydraulic reservoir of a Liberator fighting over Maloelap in the Marshalls started a fire in the tail section, Sgt. Horton directed the crew in putting out the fire, using not only the standard extinguishers but also cans of fruit juice when the fire threatened to get out of control. Then, with one engine gone, the automatic pilot burned out, the remote control compass and radio compass rendered useless, and clouds preventing the taking of celestial observations, Capt. John J. Lieb and Lieut. William L. Welsh brought the plane home over a distance of more than 1,000 miles.

Gum chewing may be frowned upon by Emily Post as not quite the proper thing to do in polite society, but in a giant Sunderland flying boat it proved a life-saver. The big Sunderland sank a sub in the Atlantic but not before German shell-fire tore a hole in the

plane's bottom and knocked out several rivets. A makeshift patch was plugged over the large hole; then some furious gum chewing started as 55 sticks of gum, handed out to the crew, were rapidly reduced to a nice putty consistency. The well-masticated gum was then used to plug up the rivet holes and seal the edges of the makeshift patch. By the time the plane reached its base, the gum had hardened and only a trickle of water penetrated the hull when it was set down at its base.

When it comes to removing excess weight from a crippled bomber, Yankee fugitives from a demolition squad really go to town. "Lady Liberty," a Flying Fortress, was in trouble over Germany. With two of its motors out, it was rapidly losing altitude. After jettisoning the bombs and dumping out everything removable, including all the guns, the big plane still continued to lose altitude. Looking around for more weight to ditch, the crew spied the "home" of Sgt. David Cameron, ball turret gunner. It didn't take much persuasion to induce Sgt. Cameron to give up his "home." After worming him out of the turret, Sgts. Raymond Calvert, Glen Bratcher, and Edward Skiba, with Cameron's help and at furious speed, took off gear boxes, unhooked power and oxygen lines, stripped the turret supports, and, using the gunbolt as a hammer, knocked the turret out of the plane—the first time on record a ball turret has been jettisoned in combat. In 15 to 20 minutes, they completed a job that takes about two hours to do in training school.

Every so often, Germany springs a new secret weapon on the Allies hoping to beat or scare them into surrender. A recent example of this was the radio-controlled glider bomb, which when released from its mother plane, and guided by remote control, was supposed to fly unerringly into its objective. At least one of the glider bombs, however, back-fired on its creators according to observers on Allied warships off Anzio, who saw a German plane being chased by its own glider bomb. When last seen, the plane was taking evasive action, grimly pursued by the missile that wouldn't take orders from the "master" race.

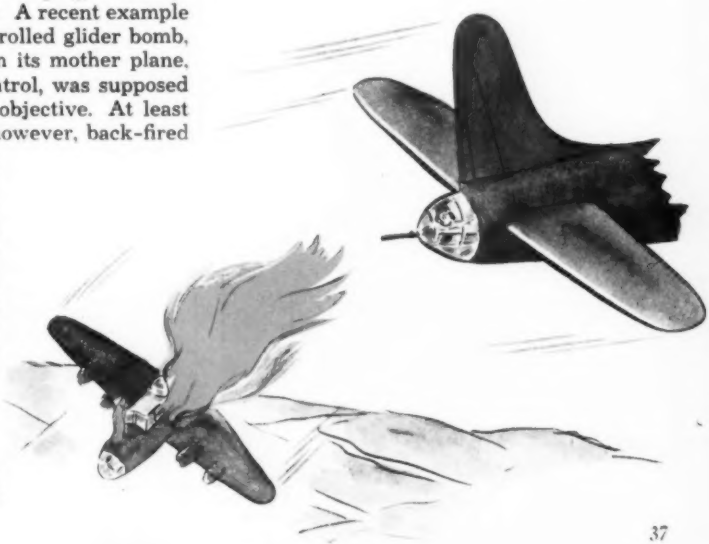
The tales of daring and sacrifice that come back with each mission testify to the fighting spirit of fliers who know what they are fighting for and won't give up, even in the face of certain death. In one pitched battle over Germany, a Flying Fortress was cut in two by cannonfire; but as the tail section hurtled earthward, tracer bullets were seen streaming at the enemy from the doomed tail gunner.

A type of accident that is fortunately rare was reported by Lieut. Alfred Turner, navigator of the Fortress "Tutty Breath," one of a formation flying deep into Germany on a bombing mission. A Fortress in the next group to his exploded in flames as a German bullet hit it squarely. The others knew it was out of the fight; but then they saw the blazing wreck swerve and, in a kind of tragic billiard shot, collide with the next Fort. That in turn hit a third. The third careened into a fourth, and it into a fifth. As Lieut. Turner described it,

"Everybody was dodging all over trying to get out of the way. The 'Tutty Breath' lurched violently, but managed to avoid the weaving planes. Our only damage came from pieces of the exploded Fortress. One went through our tail and the other through the fuselage.

"Below us as we joined our formation we could see the five shattered Fortresses spiraling slowly earthward in flames. It was a horrible sight even for fliers hardened by many missions.

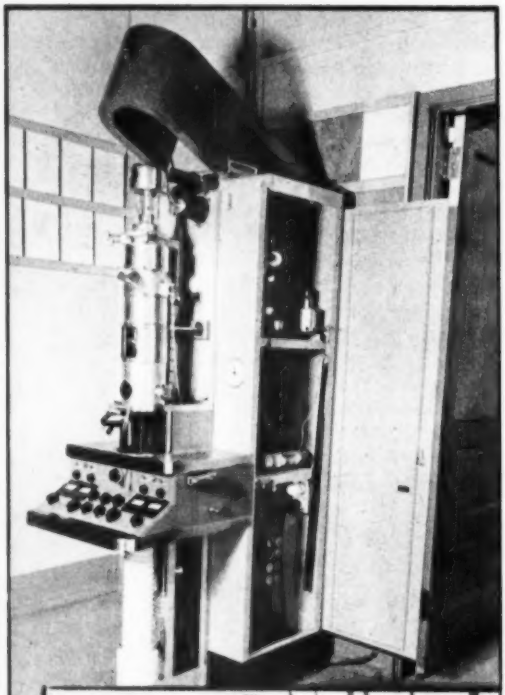
"By the time we had been hit by the parts from the exploded bomber, I figured maybe it was about [*Continued on page* 62]



"Sgt. James Raley fell 19,000 feet in the tail section of a B-17 and only split his chin."

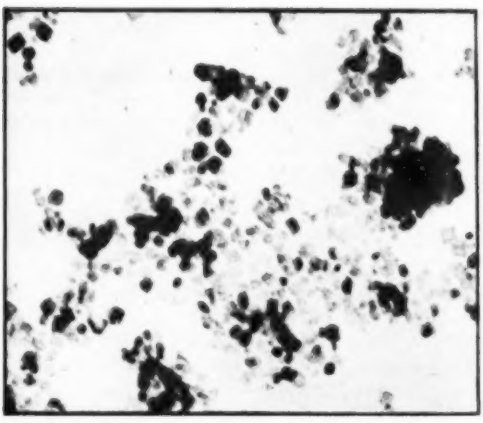
200,000X!

RCA's electron microscope, vastly improved in electrical and mechanical details, is working overtime for science and industry today. Its total useful enlargement—100,000 to 200,000 times—dwarfs the 3,000 magnification of the best optical microscopes. The electron apparatus is unique in that it bombards the object being examined with a concentrated beam of electrons, which assumes the pattern or "image" of the specimen after passing through it. This image is blown up as many as 20,000 times by a system of "magnetic lenses." Having a much shorter wavelength than light, electrons "see" far smaller details.



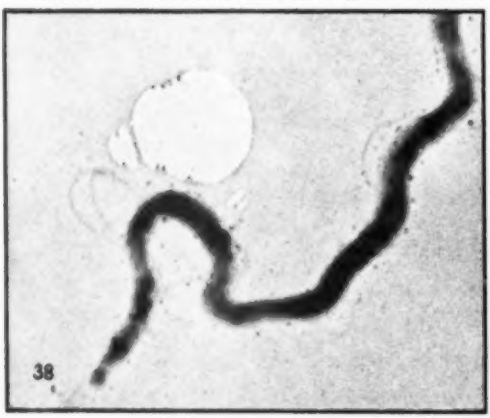
Left, RCA's new universal electron microscope. Its "heart" is a steel column mounting an electron gun.

Above, the console model of the "super-eye." This desk-size instrument is used in schools, hospitals.

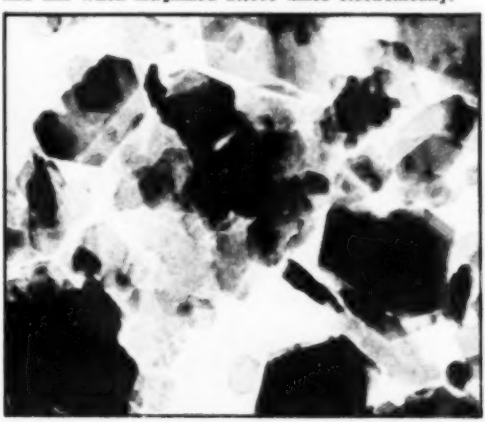


Particles of a fine paint pigment, colloidal titanium dioxide, magnified by exactly 100,000 diameters.

Electron micrograph of syphilis bacteria, magnified 31,000 times, shows new details of germ's structure.



Kaolin, a clay used in the ceramics industry, looks like this when magnified 20,000 times electronically.



THE HIGHEST FIDELITY IN RADIO

by Tom Naughton and E. H. Kelly

Here's one station that's ruled by its fanatically faithful, but highly critical, listeners. It gives them what they want—or else!

SOME time ago a certain sponsor approached WQXR, an independent New York station, with the intention of buying some of its economical time for his singing commercial. Set to a sprightly tune, it was being sung successfully over the networks. But it was not long before the sponsor discovered that here was one station that was ruled—with an iron hand—by its relatively small (by radio standards) but fanatically faithful audience. His first intimation that WQXR was different from other stations came right at the beginning. He learned with surprise that the station's executives were strangely reluctant to sell him the one minute spots he wanted. There was no objection to his product, the time was available, and there was no competing product. What other difficulty could there be?

The difficulty, it appeared, was in the form of his message. WQXR's listeners, he was told, might not like the music to which it was set. They were a sensitive and critical group. When they disliked anything they heard on the station, they let the world, and particularly WQXR know. If it was a question of an objectionable commercial, they let the sponsor know, and they did not mince words.

The sponsor was unimpressed. His jingle was a proven success. Were WQXR's listeners so different that they would fail to respond to a message that was sending countless thousands rushing out to buy his product —"today!"? He overode the executives' objections, persuaded them to sell him time, and settled back with confidence to await results.

He had not long to wait. The reaction came with the speed and power of a thunderbolt. The station was inundated with a flood of letters, some angry, some gently remonstrative, some more-in-sorrow-than-in-anger; the telephone vibrated with complaints. The

From these twin turntables go out WQXR's daily 14 hours of music.

Mrs. Eleanor Sanger, Program Director, looks over some of WQXR's more than 12,000 records and transcriptions. It would take about 100 days, at 14 hours a day, to play them all.

John V. L. Hogan, founder and president of station WQXR.

sponsor did not have to wait to hear of this from the station; he was receiving a flood of his own. Nor was the advertising agency that produced the jingle neglected.

For a time the sponsor held out. But when a public relations counsellor came to him and told him he represented a group of WQXR listeners who had hired him in a determined effort to cleanse their favorite station of the offending commercial, he capitulated. Bewildered and chastened, he went to WQXR's executives. "What kind of crazy listeners do you have anyway?" he asked wildly.

Then they took him gently by the hand and led him to a quiet place and soothed and comforted him—and explained the facts about WQXR.

He knew already that WQXR, "The High Fidelity Station," devotes 14 hours of its 17-hour broadcasting day to classical and semi-classical music; that the other three hours are given over to news broadcasts and commentaries and a few special features; that it has a mailing list of 26,000 paid subscribers to its monthly program booklet, a fertile field for survey makers; and that its loyal listeners are a good market for quality products well presented.

What he did not know was the explanation of his bitter and painful experience: that WQXR listeners are fiercely devoted to the station that brings them so much of their favorite music; that they have very definite ideas about what kind of advertising is suitable to be heard on the same air with Bach, Beethoven, and Brahms; and that they are the most articulate audience in radio in expressing their likes and dislikes. It is as terrible a thing to incur their displeasure as it is a wonderful thing to win their approval. Sponsors who had learned how to woo them found them a profitable market. The Adler Elevator Shoe

Company, for example, did not use its regular and successful jingle to reach WQXR's listeners; for them it was reset to the music of an English madrigal.

This sponsor learned his lesson like a man. With the help of the station's executives he recast his commercial in a form that would be acceptable and was soon rejoicing in increased sales indicative of audience approval.

WQXR has its home on Fifth Avenue, across the street from Tiffany and Bonwit Teller. The station is beginning to feel somewhat cramped in its present quarters, which are minute as compared with those of the big networks that occupy whole buildings elsewhere in the city. Because most of its programs are made up of recorded music, WQXR does not need the huge studios and staffs required by the network stations, and its time rates are accordingly lower than theirs. A studio orchestra of some ten men under the leadership of Leon Barzin, one of the finest conductors in the country, plays almost all the "live" music that the station offers.

Letters pour in from listeners, saying what they like—and dislike.

WQXR's place on the radio dial, 1560 kilocycles, is known to most radio listeners in the city, as well as more than 100,000 beyond the metropolitan area. An estimated 20 percent of the listeners is non-local, probably a larger percentage than that of any other station. College communities are hot-beds of WQXR fans, but listeners are to be found in cities and hamlets of all sizes in New England, the South, and west to the Mississippi. The one thing listeners have in common is a love of serious music, and it is solely by catering to that love that the station has developed in eight years from very small beginnings.

The beginnings were, in fact, accidental. The station is a by-product of experiments in high fidelity sound transmission carried on by its founder and president, John V. L. Hogan, radio engineer, inventor, and consultant. As early as 1906 Mr. Hogan was an assistant to Dr. Lee de Forest, the "father of radio," and during the First World War he designed and produced radio outfits for various types of ships. During the twenties, while he was active as a radio consultant, he became interested in high fidelity sound transmission to accompany televised programs and in 1928 got permission to build W2XR, an experimental station, which began to operate in 1934. Because the high assigned frequency of 1550 kilocycles was in an uncrowded area of the broadcast band, Mr. Hogan was permitted a channel twice as wide as that granted on the more populous lower band. The width of the channel permitted real high fidelity broadcasting, covering the whole range of audible sound from 16 to 16,000 vibrations per second, and justifying WQXR's sub-title, "The High Fidelity Station."

As sound accompaniment for his televised pictures, Mr. Hogan used records of the music he liked best, suiting the music to the picture when possible. In those days few people had television receiving sets and many radios were not adjusted to receive broadcasts at W2XR's high frequency; but the few who did pick up the sound programs enjoyed them and wrote to Mr. Hogan to tell him so. He did not realize it immediately, but WQXR was being born then.

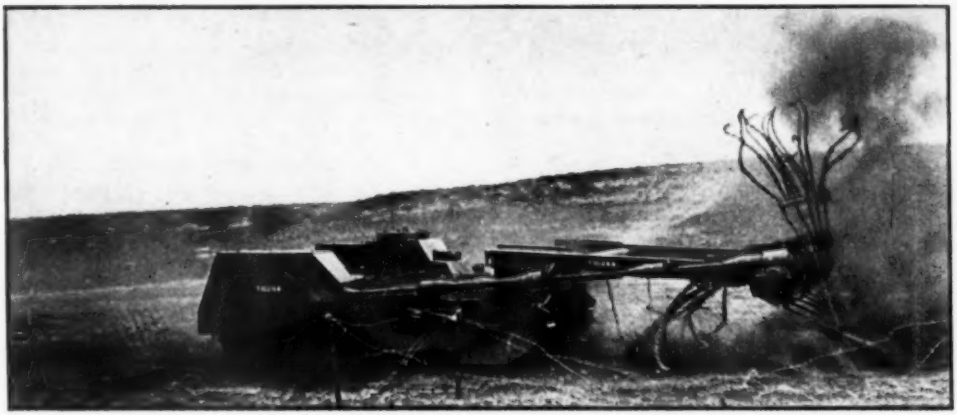
W2XR's programs were few and unannounced and came at irregular times, but more and more people were hearing them and were writing to Mr. Hogan to request that he play their favorite pieces of music. The programs and the audience grew together until in 1936 Mr. Hogan obtained a license from the Federal Communications Commission for a commercial broadcasting [*Continued on page* 62]

LAND MINESWEEPER

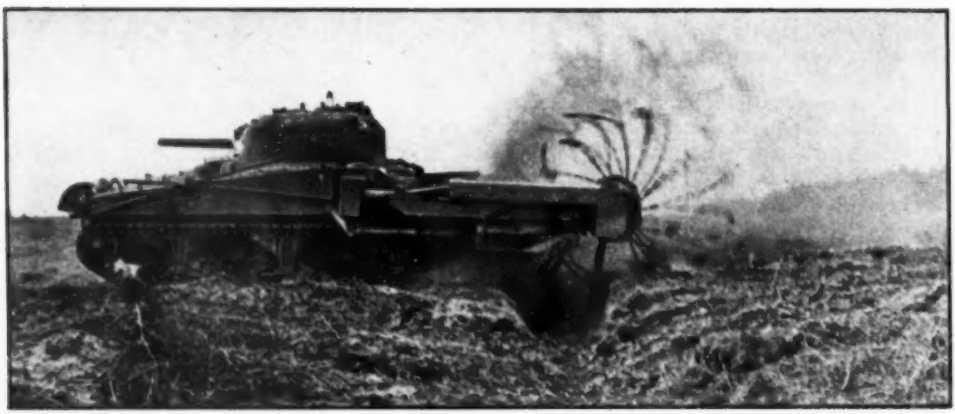
Photos from British Combine

DETAILS of the British "flail tank," which is beating a path for our invasion troops, have just been released. Sherman, Matilda and Valentine tanks have been transformed into "scorpions" by the addition of a steel cylinder fitted across the front. As this cylinder revolves, it lashes the ground ahead of the tank with lengths of chain several feet long, causing any mines in the way to explode harmlessly.

Left, a much battered flail tank that saw plenty of action in Normandy. Holes in cylinder were caused by mine explosions.



Above, an improved model of the flailer, with cylinder driven by tank's engine instead of separate motor. Below, another version of the minesweeper. One such tank destroyed 47 mines on one jaunt without damage.



FAREWELL TO THE FLIMSIES

The telephone in the engineer's hand is the sign of a new era in railroading. With it he can speak to his conductor in the caboose of this freight train and to station operators along the route.

by John LaCerda

Pennsylvania R.R. introduces new train-to-station, train-to-train, phone service on Bel-Del Line and increases speed and safety.

THE BL2 is running late. Pounding through the fog-shrouded night, she roars down past the gorge, clatters over the Frenchtown crossing and thunders onto Jackson's Bridge.

The fierce glow from her firebox is reflected, angry and red, on the racing, flood-swollen stream below.

The freight, a mile long, heavy with high-priority war goods, quickly clears the bridge. As the caboose jounces across, the conductor sees the faint flicker of flames down on the crossties.

They flare up, falter, leap high again in the swirling rush of air behind the train.

The conductor reaches for the telephone on the caboose wall. He lifts the receiver, pushes a knob on the telephone box. Calmly, in tones no louder than he would use to call up the man next door for a game of pinochle, he says:

"This is the conductor on BL2 calling

The old, inefficient way of picking up messages and orders: the fireman picks up the light pole the station master is holding by putting his arm through the loop. Then he takes the "flimsy," (message), off the pole, which he drops on the ground.

the Frenchtown operator. Come in, please."

The loudspeaker on the wall behind him crackles:

"Frenchtown speaking. Come in, BL2."

The conductor tells Frenchtown the bridge is burning. He asks if he should stop the train and put out the fire.

"No," comes the answer, clear and strong despite the clatter inside the swaying caboose. "You continue ahead. We'll take care of it with a section gang."

So the BL2 rolls on to its destination and the section hands put out the fire. Once again the Pennsylvania Railroad's two-way telephone has saved precious time and perhaps human lives.

The electronic train telephone—permitting continuous verbal communication with moving trains, between trains, and between the head and rear of trains—is something new to railroading. It has been a long time coming.

Certainly when the roads begin their general postwar remodernization it is not too much to believe that their plans will include some such device for instantaneous contact. On single-track systems, stretching across many of the nation's vast spaces, the advantages of the apparatus are obvious.

The Pennsy, biggest rail system in the United States and certainly one of the most safety-minded, chose the Belvidere-Delaware Division, once the property of the historic Camden and Amboy Railroad, for its experimentation. Winding for 67 miles through the scenic hills along the Delaware River northwest of Trenton, N. J., its one track carries a heavy volume of freight and some passenger traffic.

Immediately following the opening of the installation, its worth was underscored when an engineer, after calling to his fireman to take the throttle, for some reason climbed back over the coal tender. His head struck an overhead highway bridge.

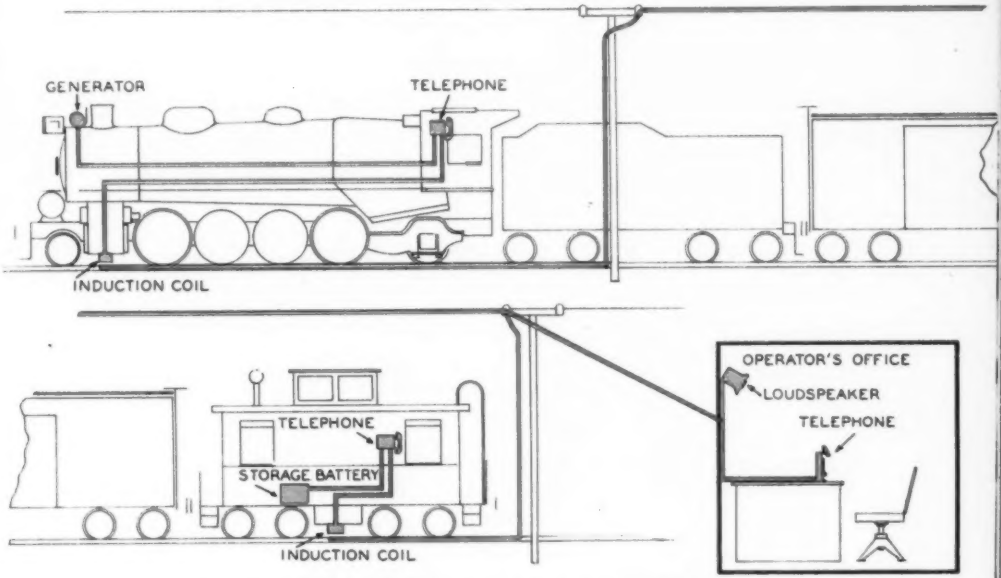
Killed almost instantly, he tumbled back across the coalpile and lay there. When the fireman saw what had happened he grabbed the newly-installed telephone. As he talked to the conductor in the caboose 124 cars away, and to the Frenchtown operator 10 miles be-

yond, he applied the airbrakes. Within a matter of minutes, a doctor and a coroner were at the scene and the train was able to resume its trip.

And so the incidents which prove the advantages of the telephone occur.

Every call placed is entered on a record chart in the Frenchtown station. Careful account is kept of the time saved the road through use of the phones. On any average day, the savings run from 10 minutes to a half hour for each use.

During heavy fog—and along the low-lying roadbed of the Bel-Del Division, as the branch is popularly called, the mists are frequent and thick— [*Continued on page* 66]



Current from steam-driven headlight generator carries engineer's message from his telephone mouthpiece to induction coil under cylinder, which induces a high-frequency but harmless current into one rail. Current travels along rail to nearest telephone pole, by overhead line to pole nearest caboose, then back to rail and to coil under caboose, where it induces a current. Storage battery supplies power to translate current into sound over loudspeaker. Messages from caboose to engine and from train to station travel in same way. Receivers are always open, and each has its own call signal.

Station operator is listening to incoming message.

Engineer in his cab converses with station operator.

Nothing fazes our salvage engineers and port-repair experts. The Nazis thought this scuttled ship would mess up Naples harbor, but Army Engineers promptly transformed it into a pier. Five hatches can unload on it.

CLEARING INVASION HARBORS

by Beryl D. Kneen

Ever hear of a port repair ship? It's the Army's new trouble-shooter, a seagoing machine shop and fix-it that can't be beat.

A BEACHHEAD is a complex institution. The Normandy coastline may be just a jagged strip on a map, but to military engineers it's a mass of headaches and brain-teasers.

Look at the figures. To keep an invasion force of 500,000 men (a purely hypothetical figure) supplied with food, necessary replacements of fighting equipment, fuel, gas, oil, medical supplies, motor maintenance, ammunition and construction and transportation equipment, a minimum of 750,000 ship tons per month is required. That's the equivalent of 68 fully loaded Liberty ships. Thus the minimum requirement would be for port facilities capable of unloading 68 or more vessels per month.

But that's only the beginning. Actually, when troops are going ashore with their organizational equipment, much higher port

capacity would be required. In its absence, there's no way out—troops must haul their equipment ashore over the beaches, as they did in Sicily. Or they're forced to land without much of their heavy equipment and transportation, as they did in North Africa. And there's a further complication. While ports are choked with the heavy landing of troops and equipment, more equipment and material for the repair of the port must be brought in on the double.

The problem of port repair didn't stump our military engineers when it first cropped up. They were ready for it. Figuring prominently in their carefully laid plans was the latest over-sized gadget of military science—the new seagoing repairman that the Army has dubbed the "port repair ship."

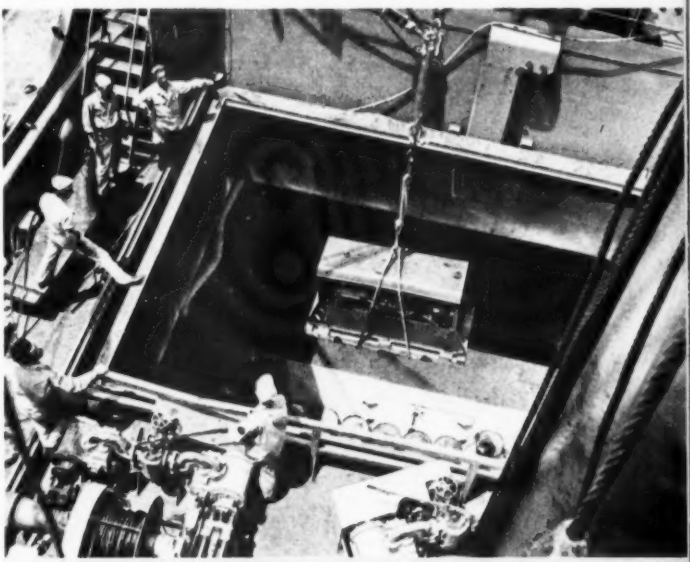
The first port repair ship of the United States Army Engineers, the Junior N. Van Noy, put out to sea in May and headed for the harbors of Europe to help clean up the mess that invasion makes of harbors.

The ship was converted from the old West Coast steel freighter, the Josephine Lawrence, which used to plow up and down the Pacific carrying lumber. Designed to clear away wreckage in sabotaged ports so that troops and supplies may pour into Europe, the ship is also equipped to aid in port operations until more or less permanent facilities are re-established.

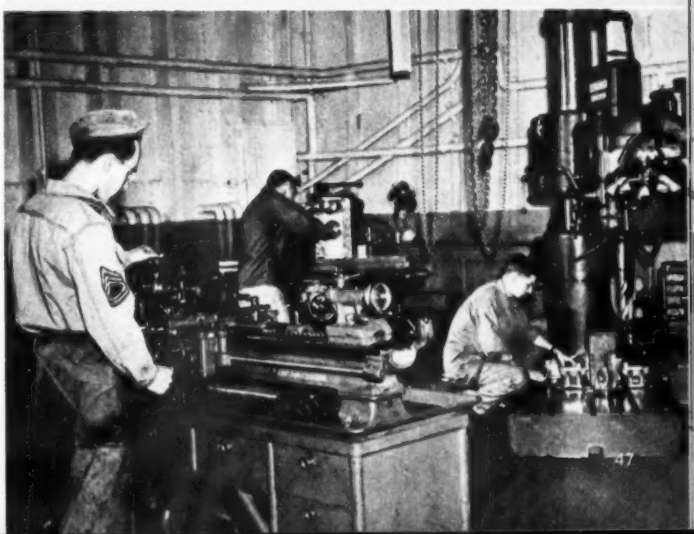
While divers may be climbing down its sides to cut away underwater obstructions, the men on deck can be pouring water onto flaming buildings from the fire-fighting equipment of the ship and its cranes can be swinging supplies ashore from other vessels.

Until the recent invasion of Europe, Naples was the horrible example of a ruined Nazi port. In addition to sabotage on the part of the Nazis, Allied bombing had accounted for almost one-half of all damage to the warehouses on the piers and buildings in the harbor area. One Allied bomb had struck directly on the quay and the crater that resulted was so large that the Engineers did not even try to fill it up. They cleaned it up a little and used the crater as a harbor for small light craft.

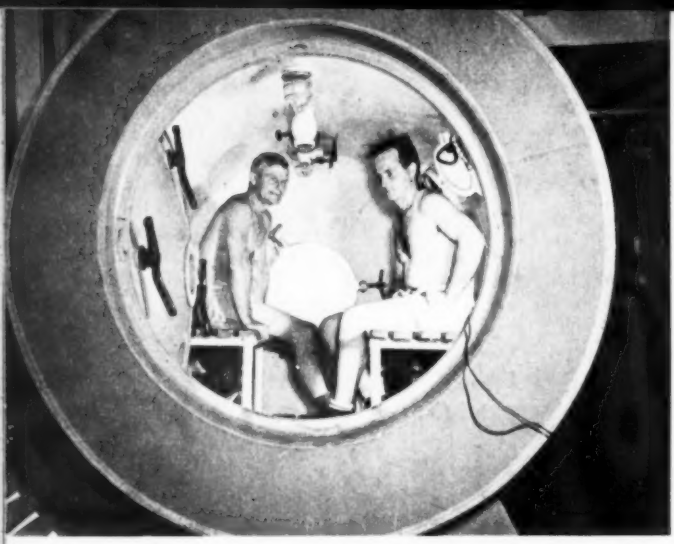
One half to two-thirds of the damage to the bulk oil storage at Naples had been caused by Allied bombs, according to Col. Gorlinski.



The port repair ship is amazingly well equipped with every conceivable type of equipment, from bolts to power plants. Here's a generator being lowered into the Van Noy's hatch.



This machine shop would be welcome in any modern factory, but it's needed aboard the Van Noy.



This recompression chamber was designed especially for use aboard the port repair ship in case of enemy attack while divers are under water. Men are pulled aboard and placed in chamber to avoid getting "bends."

At least five large ships were sunk by bombs and the Germans in addition had sunk or scuttled 32 large vessels at the quays and piers in locations designed to prevent Allied ships from using normal berths. Also 300 smaller vessels, including barges, lighters, fighter boats, and smaller ships were sunk in the harbor. All cranes were destroyed and wharf cranes were not only damaged by skillfully placed demolition bombs, but many had been run to the edge of the piers and toppled off into the water by detonations. Charges were also carefully placed to tip port buildings into the harbor as they were blown up. This destruction was often more effective than ship sinking. Also light, water and sewer systems were damaged, so that work to replace these had to be done rapidly.

The only bright spot in the Naples wreck was that the Germans did not succeed in doing as much damage to the pier as they would have liked, because the wharves were built of heavy masonry and often filled in with earth, so that damage done could be quickly smoothed over. Into such examples of wreckage the Junior N. Van Noy will proceed with its divers, its mechanics, its machine shop, its electrical generators for lighting up the port area while work proceeds. Fast work has been done on such jobs and the Van Noy's equipment will step it up to a higher speed. At Naples the Engineers' Port Construction and Repair Group entered the city October 2, the day after Naples was taken, surveyed the damage and picked locations where operations might be started. The Navy swept the harbor of mines and the Engineer Combat regiments entered the port from the landward side and cleared a road around the foot of all the piers. Naval units began dragging for sunken ships and underwater obstacles.

First priority was given to clear unloading points for lighterage craft so that the supply ships could be unloaded. Then berths for ships had to be provided so that Liberty ships could come in. By October 3, many points for lighters had been provided and by October 4 the first ship berth was ready. From then on berths were made available regularly and each day saw more ships pulling up to the repaired and improvised piers. At Naples the Van Noy would have been a lot of help.

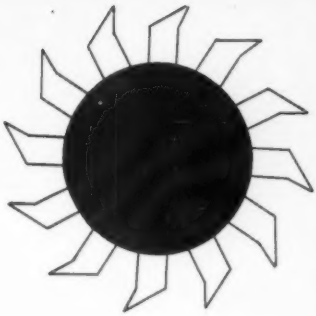
The men working the ship and assigned to special mechanical jobs in port repair work have had mostly a mechanical background. Many operating the ship have had long sea experience. However, a good many were landlubbers and the captain ruefully confessed that all but six of the crew were seasick on the trip from Mobile, where the ship was converted, to Philadelphia where the ship was rechristened.

In addition to their basic Army training at Fort Belvoir the men attended naval schools. The ship itself was planned by the Corps of Engineers in cooperation with the Navy and the Army Transportation Corps, after theatre requests for floating workshops and heavy lifters were received. The Navy was able to supply its background of information based on years of experience with seagoing repair shops, such as the U.S.S. Vulcan.

Some port repair ships had been supplied to our Allies previously to the commissioning of the Van Noy and an unspecified number are being fitted up in the United States for use of our own forces. The early British operations in the Middle East caused the first development of port repair ships, when the actions at Bengasi and Tobruk resulted in damaged ports, breakwaters and ships wrecked in harbors.

The Van Noy has a gross tonnage, after remodelling of 2500 [*Continued on page* 147]

CYCLES PREDICT THE FUTURE



by Donald G. Cooley

Author of "Your World Tomorrow" (Duell, Sloan & Pearce)

Everybody's talking about "the rest of your life." What will it be like? Cycles help to picture it.

THERE is no reasonable doubt that the world of tomorrow will be different from today's. It always has been. But at the same time, there have always been striking similarities to world patterns of yesterday. Just how different will the future be? Impressive evidence indicates that we had better be prepared for:

More wars, with the possibility of another world war in the 1950's.

Bloody civil wars and rebellions in totalitarian countries.

Continuation of capitalism, with participation of workers in business management but without state control.

Rugged individualism, reaction against socialism and communism.

Bitter strikes and labor troubles.

Race riots, many clashes of bolder minorities.

Vigilante committees, K.K.K., and similar self-elected enforcement groups.

Less bureaucracy, government more decentralized, minimum of state regulation, more local boss rule.

Cut-throat competition in business, free trade, lowering prices.

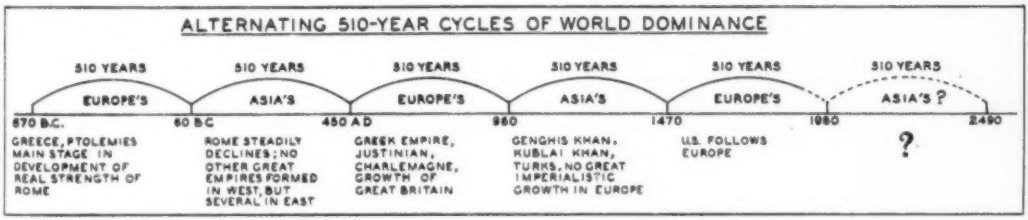
Upsurge of democracy, bad times for kings and dictators, trend to republicanism.

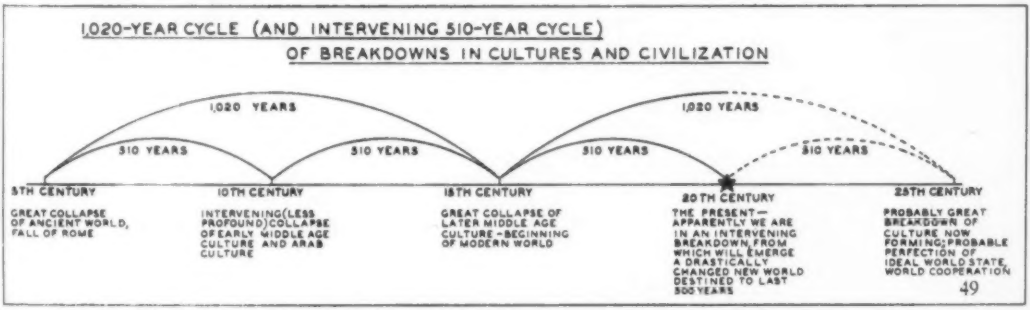
Educational systems more widespread and freely available, with new emphasis on science and mathematics.

Growing dominance of Asia and the Orient in world affairs.

League of Nations—No World State (i.e., super-league, world cooperation to prevent wars) until 25th century, but *radical changes* the rest of this century to lay foundation, and beginning of a new Golden Age around 2,000 A.D.

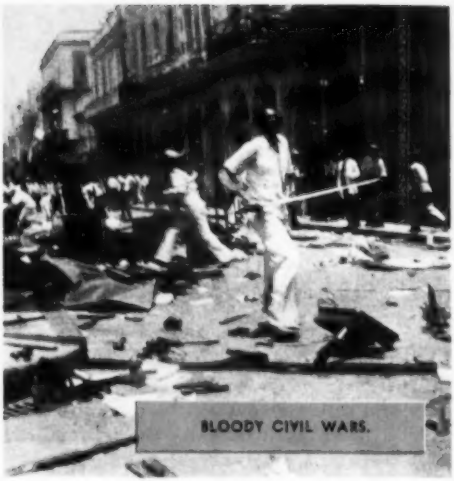
Some of these forecasts may please, others surprise or shock you. They are drawn, however, from the most exhaustive scientific study yet made of cycles in world history. Out




1,020-YEAR CYCLE (AND INTERVENING 510-YEAR CYCLE)
OF BREAKDOWNS IN CULTURES AND CIVILIZATION
1,020 YEARS
510 YEARS
510 YEARS
1,020 YEARS
510 YEARS
510 YEARS
5TH CENTURY
10TH CENTURY
15TH CENTURY
20TH CENTURY
25TH CENTURY
GREAT COLLAPSE OF ANCIENT WORLD, FALL OF ROME
INTERVENING (LESS PROFOUND) COLLAPSE OF EARLY MIDDLE AGE CULTURE AND ARAB CULTURE
GREAT COLLAPSE OF LATER MIDDLE AGE CULTURE - BEGINNING OF MODERN WORLD
THE PRESENT— APPARENTLY WE ARE IN AN INTERVENING BREAKDOWN, FROM WHICH WILL EMERGE A DRASTICALLY CHANGED NEW WORLD DESTINED TO LAST 500 YEARS
PROBABLY GREAT BREAKDOWN OF CULTURE NOW FORMING; PROBABLE PERFECTION OF IDEAL WORLD STATE, WORLD COOPERATION

Cycles Predict:

UPSURGE OF DEMOCRACY.


BLOODY CIVIL WARS.

at the University of Kansas, Dr. Raymond H. Wheeler and his staff have, with incredibly painstaking care, charted the rhythmic swings of world events since long before the dawn of the Christian era.

The Wheeler cycle studies give us astonishing evidence that the affairs of man recur in fairly regular—and therefore predictable—rhythms. Trends in civilization swing in one direction, then sweep backward, like a pendulum. If we know the present position and direction of the pendulum of world affairs, we can forecast the time and direction of its cycle. Knowing past cycles, we are no longer confined solely to present events in predicting what is to come.

Analysis of current events does, however, strikingly confirm many aspects of Dr. Wheeler's picture of the world we are coming to. Leo Cherne, noted economic analyst, in his book, "The Rest Of Your Life," paints a portrait of tomorrow very similar to Dr. Wheeler's. The principal difference is that Cherne sees government as somewhat more dominant and centralized.

The two great cycles which Dr. Wheeler finds running through history are respectively 170 and 510 years in length. The shorter cycle is one-third of the longer. There is also much evidence for a still longer 1,020-year cycle. When shorter cycles coincide with longer ones, effects are intensified.

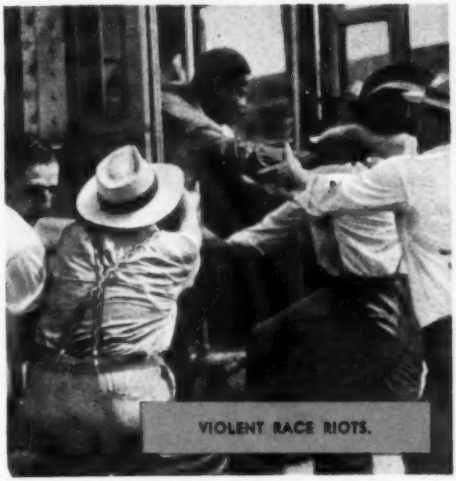
Just what are these effects, and why should they recur so rhythmically? An apparent reason *why* is that cycles coincide with world climatic changes. In fact, the changes in climate may impose certain kinds of conduct upon human beings. Our brains, nerves, bodies are complex mechanisms for the conversion of energy which ultimately has but one source: the sun. Your state of ambition in crisp fall weather is different from what it is during a July heat wave.

At all events, it is historically true that peoples of warm tropical climates are relatively timid, unaggressive, reflective, less inclined to resist tyranny or slavery. It is the folk of cooler regions who are vigorous, democratic, insistent on the individual's rights, willing to fight for freedom. Swings of world climate from warm to cool or vice versa bring similar mass changes in human behavior.

This very brief summary, which by no means does justice to Dr. Wheeler's exhaustive studies, helps to make cycle predictions for tomorrow seem reasonable. For both the 170 and the 510-year cycles are due to coincide around 1980. They should bring at that time one of the coolest periods in history. The downswing from warm to cool has probably already begun, and though temporary short warm cycles will intervene, the general prospect for the remainder of the century is cooler. With this climatic change, we may expect the kind of human conduct that has always accompanied it.

Briefly, we may expect a great upsurge of democracy, rise of the masses, minorities more willing to fight as rights of the individual are emphasized, more vigor and courage in human stocks. The implications are far-reaching and tremendous. Let us examine a few of them.

The present conflict (like innumerable others) is sometimes heralded as "the last war." There is little in history or cycles to indicate that war is soon to be banished from



VIOLENT RACE RIOTS.

BITTER LABOR STRIFE.

the earth. Wars follow climatic cycles too. Great international wars occurring during transitions from cold to warm have generally been, as Dr. Wheeler describes them, "nation building." But on transitions from warm to cold (as at present) they are "nation falling" wars and are characterized by fanaticism, cruelty, torture, barbaric treatment of civilians.

The present war is running true to form. That it is nation-falling as concerns Japan, Germany and Italy we have no doubt. It may well be so for smaller countries such as Finland, Esthonia, Poland, Lithuania, Rumania, Bulgaria, and the like. As for barbarism, the use of robot bombs, the wiping out of cities like Rotterdam, Jewish massacres by the Germans, fiendish treatment of prisoners and civilians by the Japs, need hardly be pointed out. It is all running true to the cycle.

Toward what unfathomed end is the titanic world upheaval moving? The cycle, at least, is advancing toward a great civil war epoch and a resurgence of democracy. Dictators and tyrants (typical "hot era" products) are doomed not only by Allied arms, but [*Continued on page* 146]

GROWING DOMINANCE OF ASIA.

BEGINNINGS OF WORLD STATE.

Mangbetu women of Central Africa modelling the ultimate in summer styles

JUNGLE HEADWORK

by Commander Attilio Gatti

Life among the Mangbetu, the cleanest, most talented, most intelligent natives of Central Africa—who like their heads long.

"LOOK at that woman!" exclaimed Bob, one of our cameramen. "She is *torturing* that poor defenseless child. That's sheer cruelty. Can't you stop it?"

Bob usually liked to pass for a tough guy, but now he showed deep concern. His agitation was real—and no wonder! What that native woman was doing to her own little baby was inconceivable to an American's mind. Sitting on a stool, she was firmly holding the plump few-months-old infant in her lap. Entirely ignoring our intrusion as well as his whimpers and cries, calmly she went on tying around his tender skull a long, strong, rope of pleated antelope hide. But hard—so that each turn of the rope would dig deep into the child's tender head.

"Can't you stop it?" asked Bob again. "It makes me sick to watch the kid tormented this way. See? His skull has already been deformed to look like—like a cucumber. Who knows how long this has been going on!"

"Since the very day that child was born," I told Bob, to his surprise. "And, believe it or not, what that woman is doing, so callously as you think, but so conscientiously and painstakingly, really, is the greatest proof of her maternal love. Strangely enough, she is doing that child a service for which he will be obliged to her, and more proud than you can imagine, all his life."

"Yeah!" said Bob skeptically. "As if any

child could survive such treatment. . . ."

"You bet he will. Let's go near them. Then you'll see that his mother has the same kind of deformed head—yet she is healthier, stronger, more alert and intelligent than any other native woman you have seen in Belgian Congo, as yet. Come on!"

"Yes," she said serenely in answer to my questions. "Many hours, each day, have I devoted to this task. For this is my first child, the son of sultani Ekibondo, who is great among the kings of the Mangbetu. Only six months old, my child is. But his head already shows the nobility of his blood, the amount of time that his father's wealth has permitted to be spent on him—and his mother's loving care, every single day since the very one when he was born."

Later that same day, all the vehicles of our expedition joined us. We pitched our camp in a perfectly-kept square of ground that King Ekibondo of the Mangbetu put at our disposal just outside his enormous village.

To be more exact, instead of village, I should say that the huge place was his private home, for it was composed of hundreds and hundreds of well-built, beautifully-painted, cleverly-aligned huts, storehouses, granaries, and so on. Those were the minimum quarters required for his immediate family and their most indispensable servants, musicians, hunters, and policemen. The woman with whom we had first talked was only one of the *ninety-seven* girls King Ekibondo had married, and of the even seventy wives he still had left. The six-month-old boy we had seen treated by her was only one of Ekibondo's *one hundred and eight children under twelve years of age!*

Everywhere in the enormous village reigned an order, a discipline, and a cleanliness such as my companions had never before observed in Africa.

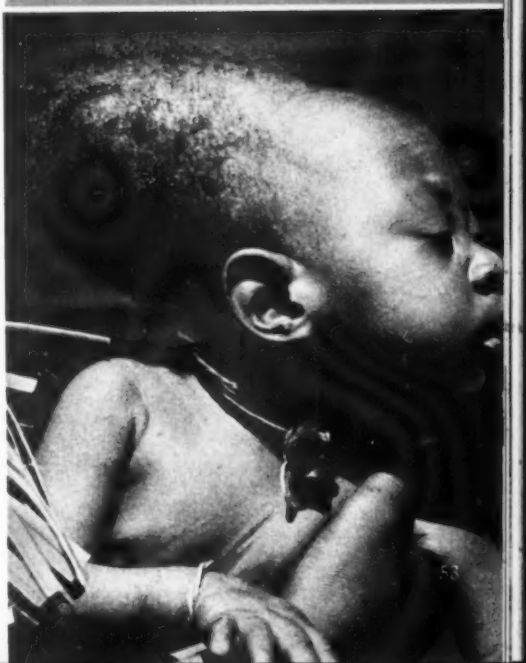
Most of the Mangbetu men who resided in the village or came to it to visit with relatives and to pay homage to the King were physically strong, muscular, hard-looking. Yet they revealed themselves as extremely quick of mind, polite to an almost courtly degree, surprisingly kind and tender in their relationship to women and children.

The average woman was well developed and spotlessly clean. You could see she was deeply interested, and highly efficient, in the management of the big hut in which she lived with her own children, as well as in the supervision of her female servants and of the quarters occupied by them.

Little boys and girls, in general, were

This young mother is winding 50 feet of rawhide cord about her son's distended head.

The length of this baby's head is a sign that his father has wealth, nobility, and many servants.



Tattoo marks, braided hair, make this girl a beauty.

Mangbetu women spend hours on elaborate coiffures.

delightful. Beautifully kept, wonderfully mannered, they stuck constantly near their mothers, played quietly among themselves, seldom cried, and never showed fits of temper. After having overcome their shyness toward strangers, they became quite good friends with us. They were quick in answering our questions and prompt in executing with the utmost solemnity whatever we asked them to do for our photographs and movies. Bob had to agree that they were by far the best and most conscientious "actors" we had encountered during our whole expedition.

Furthermore, all of them—men, women and children—displayed artistic aptitudes markedly superior to those of any other natives we had met.

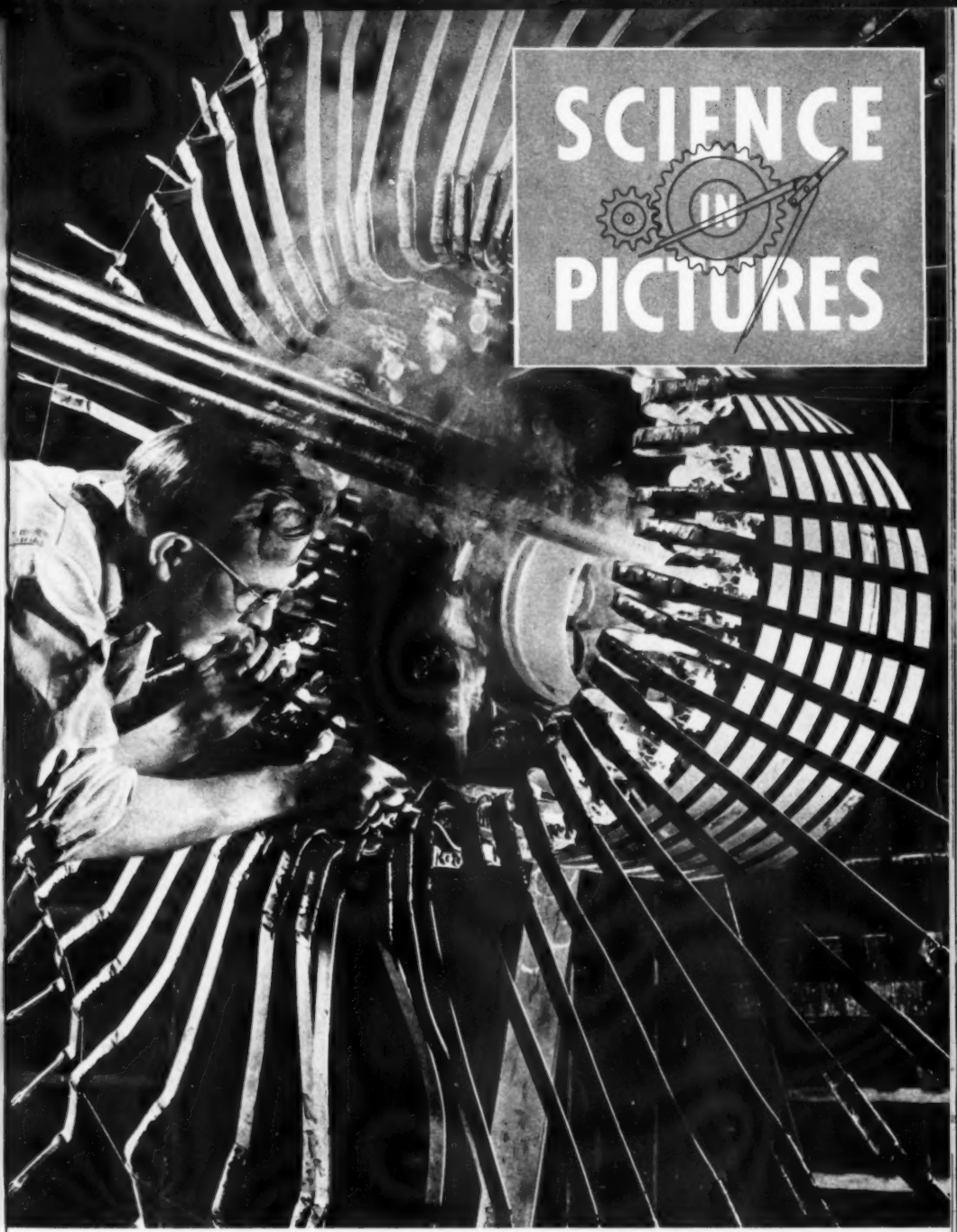
But where women really go to town is with their own skin and hair.

The skin they decorate with elaborate tattoos in relief. They embellish it with a shiny gloss of palm oil, or—according to the occasion and the mood—with complicated designs made with the juice of certain fruits. The hair they build, by helping each other during unending hours lightened by much clatter, gossip and giggles, into the mushroom-like coiffure which is peculiar to their race and an exclusive prerogative of it.

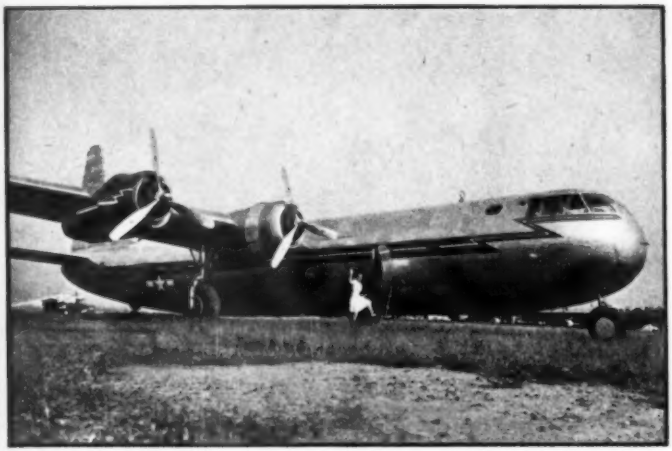
Of course, the whole purpose of this complicated arrangement of the hair is to underline and exaggerate the already elongated form of the skull that a woman has acquired during her earliest childhood. Much as one tries, a skull can be stretched just so much, and then no more; but its length, excessive as it may be, still fails to satisfy the coquetry of the Mangbetu girl and the ambitions of her beau. Hence this hairdo, that adds several more inches and forms a sort of unremovable crown which requires permanent attention.

A nuisance? Sure! But that's just the point—or, at least, one of the points of the whole thing. As we have seen, the fact that a girl's skull is so elongated proves to all and sundry that her mother has spent most of every day during the girl's first twelve months of life in patiently shaping her bones that way. That means that the mother possesses several servants to do all the household chores in her stead. That, in its turn, indicates that her husband is well-to-do. And because, among the Mangbetu, sultans, Kings, chiefs, and great witch-doctors all inherit their rank and are the only ones who can accumulate riches because so many people pay them tolls and fees, such leisure on the part of their wives automatically implies also the nobility that normally goes with wealth.

So it is with a wife's coiffure. To make that crown of hers, [*Continued on page* 145]



LIKE A SPIDERWEB spread to snare flies, the copper threads of this collector for a synchronous converter stretch out to gather in electricity to a central point where it can be changed from alternating to direct current. A worker at Westinghouse Electric is soldering armature connections in this picture. Unit will be used in manufacture of aluminum.



Tomorrow's Air Liner Is Here Today

FIRST of the Liberator Liners, commercial sister ships of the B-24 Liberator bomber, is shown here at LaGuardia Field awaiting inspection. Known until recently as the Model-39 (see MECHANIX ILLUSTRATED, August), the Liner can carry 48 passengers and 1,200 pounds of mail 2,500 miles a a cruising of 240 m.p.h. Consolidated-Vultee built her.

Swift Sheep Dog Of The Convoy Herd

THE lean, trim lines of this Patrol Craft Escort indicate the kind of work it was designed for: shepherding convoys through submarine infested waters and hunting down the wolf packs that prey on heavy, slow convoy craft. The 800-ton ship bristles with depth charges and anti-aircraft guns along its 185-foot length. Picture shows Lake Michigan test.

X-Rays Speed Up Prop Inspection

A 400,000 volt General Electric unit takes nine simultaneous radiographs like the ones at left automatically; then skilled girl operators compare each one with specifications to detect flaws hidden from the naked eye. Propeller blade inspection goes ahead three times as fast now at the American Propeller Corporation.

Weasels Of War Can Operate On Any Terrain

THESE jeeps-with-tracks are the Army's new M-29's, better known as "Weasels." The Army required a vehicle that could negotiate snow, sand, deep mud that are often impassable by other vehicles. A personnel and supply carrier, it combines light weight with broad tracks. The pressure it exerts on the ground is only one-fourth that of a fully-equipped infantryman.

The Oldest Messenger Of War Is Still In Use

LAUNCHING carrier pigeons from Flying Fortresses presents special problems. A paper bag with a slit down the side is best solution. Bird is put in bag, which holds it just long enough to get it clear of prop's blast.

EXTRA

THE Deltagram

EXTRA

SEPTEMBER 1, 1944

MILWAUKEE, WISCONSIN

200 PRIZES GIVEN AWAY FREE IN DELTA POST-WAR SHOP PLANNING CONTEST!

You Have a Chance to Win

Here are the Prizes!

★ **1st Prize** ★
Your choice of $1,000.00 in Delta Equipment—*(retail value)*
Enough to have a complete Delta-equipped homecraft shop you can really be proud of!

★ **2nd Prize** ★
Your choice of $500.00 in Delta Equipment—*(retail value)*

★ **3rd Prize** ★
Your choice of $250.00 in Delta Equipment—*(retail value)*

★ **4th to 8th Prizes** ★
Your choice of $75.00 in Delta Equipment—*(retail value)*

★ **9th to 20th Prizes** ★
$10.00 worth of Delta Accessories and/or Supplies!—*(retail value)*
(Merchandise certificates will be awarded to winners entitling them to prizes when materials required for making Delta equipment are released by the government.)

★ **21st to 40th Prizes** ★
Set of 27 Deltacraft Project Books and Manuals! $4.50 value!

★ **41st to 60th Prizes** ★
Set of 6 Delta Tool Manuals — Value $1.50!

★ **61st to 200th Prizes** ★
1 Year's Subscription to The Deltagram! Value 50¢.

Here are the Rules
Be sure to read them!

1 The contest is open to any person of any age (male or female) residing in the United States or Canada, except employes of The Delta Manufacturing Co., dealers and distributors of Delta products and their employes, employes of Delta's advertising agency, and members of the immediate families of any of the above.

2 Entries are to consist of a floor plan or layout of the entrant's proposed post-war homecraft shop showing position of power tools, workbenches, and other major equipment, together with a statement giving the following information:

A. Reasons for adopting layout and equipment shown in floor plan.

B. List of power equipment now owned.

C. List of power equipment planned for purchase after the war, the prices you would pay, and name of store where purchase would be made.

D. List of hand tools and other accessories now owned.

E. General type of work to be done in the shop.

3 Entries will be judged on their suitability to the type of work to be done, efficiency and ingenuity of arrangement, and use of space available. Neatness and clearness will count, but not costliness or elaborateness of the proposed shop, or elaborateness of the presentation.

4 All entries must be postmarked not later than midnight Tuesday, October 31, 1944. They are to be mailed to Contest Editor, The Delta Mfg. Co., 695L E. Vienna Ave., Milwaukee 1, Wis. Entries become the property of The Delta Mfg. Co. to be used as they see fit, and none can be returned.

5 Decision of the judges will be final. In case of ties, duplicate prizes will be awarded.

6 Contestants are limited to one entry. If more than one entry is submitted by a contestant, only the first one received will be considered.

7 Final judging will be done by:
William Bachrach, Regional Coordinator of Engineering, Science and Management War Training.
E. R. Haan, Technical Editor, Popular Mechanics.
Harry Walton, Home and Workshop Editor, Popular Science.

☆ 1st Prize ☆

$1,000.00 in Delta Equipment

(Retail value)

for a Homecraft Shop!

Nothing to buy! No entry fee!

You don't have to be an expert to win!

Think of the thrill of winning $1,000.00 worth of famous Delta equipment (post-war delivery)! Or one of the many other valuable prizes in this big contest!

And think of the fun, the healthful recreation you and your family can get from these tools, as you create things of beauty and utility out of wood and metal and fascinating new plastics!

Here's How to Get It!

All you have to do is to put down on paper your idea of a practical homecraft shop. Maybe it's that shop you've been dreaming about — or perhaps it's an improvement on the one you now have.

Whatever it is, simply send us a sketch of the floor plan (don't worry, we don't expect a mechanical engineer's finished drawing)—together with a statement covering the points given in the rules shown here.

Well Worth Trying For!

You haven't anything to lose by entering this contest — except the little time and trouble you take to get your entry ready. But you do have a lot to gain!

Delta homecraft power tools — made by the largest manufacturer of power tools for the homecraft shop — are truly fine tools. They're *accurate*—they're *dependable* — they're *safe.*

It's Up to You!

Now, whether *you* win these dandy Delta prizes—or whether someone else wins them — depends solely on *you.* Certainly you can't win, if you don't enter the contest. But you *do* have a chance, if you do send us your plan.

So read the rules now. Then, get a head-start on the others by going right ahead preparing your entry.

HM-14B

... and here's how to get them!

DELTA MILWAUKEE Power Tools

Some Helpful Tips that may make YOU one of the *winners*

To start you off on the right foot, we're going to tip you off here to some of the things the judges will look for. The judges, incidentally, are recognized authorities, not connected with The Delta Manufacturing Company. They will have the final say-so on the winners.

Check off the items as you include them in your plan. That way, you won't forget anything.

- ☐ Include a floor plan or layout of your proposed post-war homecraft shop, showing location and position of the power tools you would use. Indicate the size of area it would cover.
- ☐ List the power tools you think should be part of a complete homecraft shop.
- ☐ List the Delta power tools that you would like to get after the war. Give the name of the store where you would be likely to make such purchase.
- ☐ List the power tools — if any—that you now own.
- ☐ Are any of the following materials difficult to obtain in your locality during normal times? Wood? Paint? Finishes? Hardware? Plastics?
- ☐ What kind of tool racks, paint racks, storage bins for nails, screws, etc., would you recommend? How about lumber storage?
- ☐ Do you prefer to work in wood? Metal? Plastics? Or combination of all?

The above are simply suggestions. Include any other material that you think can help put you among the winners.

Bomb Launching Platform Captured

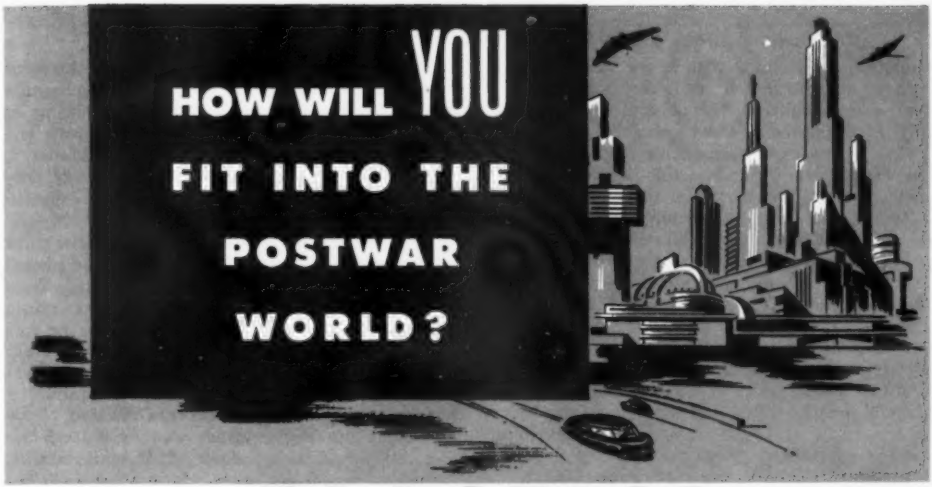
CAMOUFLAGE covers the concrete forms of this Nazi flying bomb platform captured near the French town of Delassy. Heavy and continuous bombings of such small installations as this, as well as the much larger ones which have been found, and capture of the whole French Coast are apparently the best solutions of the flying bomb menace.

Defenses By-Passed By D-Day Forces

TWO British officers are inspecting one of the obstacles erected by the Germans along the Normandy beaches in a vain attempt to block the Allies' advance. Royal Navy Commandos were among the first to land. Their assignment was to neutralize such obstacles as this, which has mine attached.

Thunderbolt In New Dress

THE latest model of the A.A.F.'s longest-range fighter has an entirely new silhouette, an electrically operated "bubble" canopy giving the pilots round-the-clock visibility, greater engine power, and larger internal gas tanks doubling effective range of action. It carries up to 2,000 pounds of bombs.



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LEARN AT HOME—You can learn plastics in your spare time at home without interrupting your present work. The Plastics Institute has developed a thorough, easy-to-understand course of training, requiring no previous technical experience. It offers complete, authoritative training based on industry requirements.

FASCINATING COURSE—The lessons are readily grasped and practical. Every step is made clear with graphs, diagrams, pictures. Actual specimens of plastics materials are furnished. A bi-weekly bulletin, "Plastics Trends," keeps you posted on new developments.

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EXCLUSIVELY PLASTICS—The Plastics Institute is America's oldest and largest plastics educational organization which devotes all of its facilities exclusively to plastics. It is held in high esteem by members of the plastics industry. Many of our graduates hold responsible positions in the plastics field.

START YOUR FUTURE—TODAY! Mail the coupon below now! We will send you an interesting booklet filled with valuable information on plastics and tell you how, at small cost, you can prepare for a career in this important industry. Don't put it off! Mail today!

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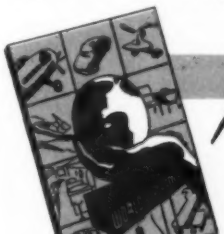

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Street.....Age.....
City.....Zone.....State.....

Drama In The Skies

[*Continued from page* 37]

time to bail out, but somehow we managed to get into another formation and keep going. Finally our escort caught up with us, and we didn't have any more trouble on the way to the target."

One of the most spectacular feats of the war occurred over Germany this spring. By coincidence, the auxiliary fuel tanks on the wings of two Thunderbolt flight leaders failed to jettison at the same time. With the tanks still on their planes they would have had to turn back home and leave the bombers they were escorting unprotected; but the wingmen flew in to rescue them, and with the wingtips of their own planes knocked the dangling tanks loose. To do this, they had to bring the wing tips of their own planes within eighteen inches of the wing tips of the flight leaders' planes.

Lieut. Paul Baker, a Navy pilot stationed on the aircraft carrier, "Lexington," when that ship was still a menace to the Japs, knew what to do when danger threatened his mother ship. Returning one night from a mission with his gas tanks almost empty, he prepared for a landing on the carrier when he was spotted by Jap planes. After he relayed the information to the carrier, he was ordered to douse his landing lights immediately and make no attempt to land.

He looked at his gas gauge, then at the Japs closing in eager to locate the carrier. There was only one thing to do: he used his last bit of gas to do it. Turning away from the carrier, he flew off into the darkness and was seen no more.

The fundamental hellishness of war, which the men who fight rarely talk about, but which courage, stoicism, and humor may gloss over but cannot conceal, is illustrated by a story related by the last member of the crew of a stricken bomber to bail out. Crippled by flak, the plane was hurtling earthward when the order was given to bail out. One youngster, pinned in the wreckage and unable to extricate himself, cried out as he watched his buddies, who had tried in vain to free him, leave, one by one. Consoling him was the officer who had given the order to bail out. When his turn came, he was overheard by the preceding member of the crew to say to the frightened youth, "Don't you worry, kid, we'll take this ride together."

America's wildlife, from deer to rabbits, geese to quail, and sharks to sardines, are helping win the war by furnishing food, furs, feathers, hides, oil, glycerine, fertilizer and vitamins.

Agar, used in bacteriological laboratory as a culture medium and also in ice cream, photographic films and as a laxative, is now obtained from gelidium, a seaweed hand-picked 20 to 60 feet under water on the California coast.

American eagles in the treeless Aleutian Islands nest regularly on the ground.

The Highest Fidelity In Radio

[*Continued from page* 41]

station with a power of 1,000 watts and the same frequency as W2XR. The four-hour broadcasting day consisted entirely of recorded programs of fine music, made up from listeners' requests and Mr. Hogan's own choices. Here was a chance, he felt, to prove his conviction that quality programs could be offered on a commercial station and be made to pay.

WQXR's program booklet, which lists the titles and composers of the compositions to be played during each broadcasting day, resulted from listeners' desire to know in advance what music they were going to hear. A man phoned the station one day in 1936 to ask whether a certain symphony was going to be presented on the following Wednesday night. He was planning a dinner party, he explained, and wanted to be sure that the work, which was to top off the evening, would be broadcast. If it would not be, he would cancel the party. Many other such requests led to the publication of a four-page booklet listing the music to be played during one month. To make sure that only those who were really interested would get the booklet, Mr. Hogan set a price of one dollar a year for a subscription. Within a month 736 persons had subscribed, and today the booklet, now grown to 48 pages, has, with the exception of *Etude*, the largest circulation of any purely music magazine in the world.

With increased power (the station now operates with 10,000 watts) and regularly scheduled programs listed in the newspapers, the station gained hundreds of thousands of new listeners. Now, on any given night, the most popular program, Symphony Hall, an hour of symphonic music, will have an audience of an estimated quarter million. At other times during the day and evening composers of the 16th through the 20th centuries can be heard, from Corelli and Chopin to Victor Herbert and Victor Youmans. Only dance music and swing are excluded, and those not because WQXR has any objection to them (it has had such music on its programs in the past), but because listeners have written and phoned in to say they can hear that kind of music on any of a dozen other stations in the New York area.

In planning programs, Mr. Hogan and Elliott Sanger, executive vice-president of WQXR, have consulted their own tastes to a great extent, reasoning that what appealed to them as nonprofessional music lovers would appeal to most people. A recent survey of program booklet subscribers showed that they were 97.7% right. The station now has over 12,000 records and transcriptions in its cabinets, and presents in a month the equivalent of several years of concert-going.

Where other stations on an average day present at the most an hour or two of classical music and have special announcers for such programs,

[*Continued on page* 64]

BIRDS OF MERCY

THE A.A.F. Materiel Command commissioned this new type helicopter from the Sikorsky Company for quick recovery of wounded men on difficult terrain. Equipped with four stretchers and the largest rotor ever used on a helicopter, the R-5 can descend vertically to rescue a battle casualty in spots where planes and ground forces cannot reach him. It has a speed of more than 120 m.p.h., a ceiling of more than 5,000 feet; can stay aloft more than three hours, and carry 1,100 pounds. The stretchers are carried in cigar-shaped metal containers attached to the fuselage.

(Above) R-5 makes rescue landing in tough spot. It can land on rough terrain where planes can't.

(Above) The new helicopter can rise or descend 50 feet in a direct line without moving forward.

(Below) Four stretchers can be carried in metal shells on the sides of helicopter's fuselage.

The Highest Fidelity In Radio

[*Continued from page 62*]

WQXR's 14-hour music schedule requires that every announcer be able to pronounce words in half a dozen languages. Not everyone can skip lightly, pronouncing each word trippingly on the tongue, from Brahms' song, *In Waldeseinsamkeit*, to Monteverdi's *Lasciatemi morire*, with, perhaps Mozart's *Venite, inginocchiatevi* thrown in. But pronunciation is an announcer's specialty; his greatest danger, as he knows from bitter experience, is in simple words, which can become incredibly and uncontrollably snarled up, as when Allen Ward, one of WQXR's announcers turned the innocent "flute solo" into "sloat flulu." Commercial and news broadcasts have their special dangers, too, as Melvin Elliott will testify: a routine one-minute spot became memorable in the station's annals when he proclaimed the virtues of a certain condiment for "chakes and stops." Duncan Pirnie disconcerted his audience and threw the station into confusion by inserting into a serious description of the fighting in the South Pacific a cryptic reference to "New Juinea Gungles." It was generally agreed by his fellow announcers that he was referring to a type of earring worn by Polynesian maidens.

But the most memorable of all occurred at the time of the Japanese advances to the East Indies. An announcer was doing a newscast describing a naval battle in a passage between two islands. He swung from that immediately into a one-minute spot describing the virtues of a cure for head colds. "Are your naval passages stopped up?" he inquired solicitously of his audience.

When a word is mispronounced, or some other mistake made, the listeners will write and phone in to point out the error, just as on any other station; but the usual WQXR listener will adopt a tone either of outraged indignation or of gentle remonstrance. Either response indicates his proprietary, even paternal, interest in the station. Nearly 30 per cent of the audience has been listening consistently for more than five years; nearly 50 per cent has been listening for from three to five years. Most listeners keep their radios tuned to WQXR and only tune out to hear a specific program on another station. This habit of keeping the dial glued to 1560 was proved a few years ago on the occasion of Toscanini's first broadcast with the NBC Symphony Orchestra, an event that was widely ballyhooed. Again the story concerns a dinner party, this time a big and formal one with the guests sitting around after dinner listening reverently to what they thought was Toscanini. The hostess became irritatedly aware that the butler was wagging frantically for her attention. She attempted to ignore him but he insisted on being heard. "Madame," he said, "you are listening to WQXR. We have Toscanini in the kitchen."

"Toscanini in the kitchen" is practically a definition of what Mr. Hogan and Mr. Sanger have always claimed WQXR to be, a station offering the best in music to the average music lover, a person with a limited income but unlimited good taste.

Establishing high standards carries its own penalties, as the station has learned. A mistake in the sequence of records of a symphony—something only a careful listener will detect—will bring hundreds of letters and phone calls of correction. Because they really listen, the WQXR audience is attractive to sponsors, but the station realized from the beginning that great care must be taken with the kind of advertising offered them. Certain rules were established: no unreliable products would be accepted; no shouting commercials would be allowed; and no bullying insinuations about the listener's internal functions permitted. When WQXR has strayed over the borderline separating the acceptable from the objectionable, it has been driven hastily back by outraged cries and sorrowful lamentations from the faithful. The uproar over the singing commercial became so great that early in April the station announced that no more would be accepted. Now, WQXR listeners can proudly boast, their ears are never assaulted by melodious merchandise.

Most of the station's programs are now sponsored. A few old timers among the listeners growl in their beards about the increasing number of commercials which are crowding in ominously on Mozart and Schubert, but perhaps an equal number write in to congratulate WQXR when it gets a new sponsor, showing a keen satisfaction in their favorite's financial success.

Early this year the New York Times bought the Interstate Broadcasting Company which controls the station, but announced that it would retain the present personnel and policies. It falls heir, therefore, to WQXR's chief source of pride—and headaches—its "High Fidelity" audience: the woman who phones in to make sure the new apartment she is contemplating taking is in a part of the city with good reception of WQXR; the man who phones early in the morning to ask how long Saint-Saëns' Fourth Piano Concerto will take on the Breakfast Symphony—he wants to hear all of it before he goes to work; and the anonymous postcard writer who summed up her fellow listeners' attitude in a single line to the station: "Stay as sweet as you are."

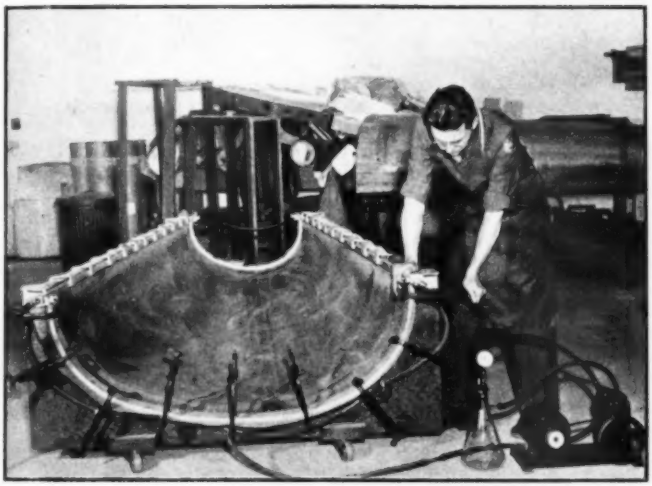
The giant puffball (Calvatia gigantea) sometimes grows to weigh 20 pounds.

There is approximately one horse or mule in the United States for every 10 persons.

Average hens lay from three to four times as many eggs per month in the spring as in November.

A Cromwell Ironhead Fights For England

ENGLAND'S latest, toughest tank is inspected by Prime Minister Churchill. It's named for hard, able, 17th century Civil War General Cromwell, who packed a mean punch himself. The gun sticking out from the heavily-armed turret is a .75 mm. The Cromwell is now in use in Normandy and is knocking out plenty of Nazi Mark IV's and speeding up the American-British-Canadian march on Paris.



Molded Glass-And-Plastic Plane Fuselage

A NEW type of plane fuselage material is being tested for durability and strength. It's molded plastic reinforced with glass. Plies of glass cloth are first impregnated with plastic on a male mold, then transferred to female mold (at left) where a rubber blanket is laid over the plies and sealed on the edges. A vacuum is drawn with a small vacuum pump.

Dogs' Keen Noses Used To Detect Mines

"BOBS" has just spotted a German mine and indicated its position by dropping a white cone over the spot. Former British household pets are being given a four months' course in detecting mines, and have been phenomenally successful.

Farewell To The Flimsies

[*Continued from page 45*]

the time economy is tremendous. For purposes of traffic control, every railroad is divided off into "blocks"—sections of track protected at each end by semaphores or other signals. Trains normally pass each other on sidings at the ends of these blocks. If one train is late, it often is desirable to let the other advance to the next siding. Ordinarily orders for these movements can be received only by stopping the train and having one of the crew walk to the nearest wayside telephone to call the dispatcher.

On the Bel-Del it is not necessary to stop to get those orders. If, let us say, passenger train 356 is ten minutes late out of Trenton, the freight which is supposed to take the siding to let 356 pass south of Frenchtown can get permission while in motion to continue to the next siding at the end of the following block.

Pennsy electrical engineers have worked with the Union Switch & Signal Co. and with other manufacturers in the communication field to perfect the phone. Their first thought was to use shortwave radio but this was found less desirable because operators have to be trained for long periods and then be licensed; also, there would be the problem of obtaining a special wavelength in already crowded air channels.

So the experts decided on a system combining the best features of radio and telephone and one which confines its transmission paths to the railroad property.

The hookup employs high frequency alternating current transmitted along the electrically bonded rails. This current is so slight that it couldn't possibly harm anyone. It can be detected only with highly sensitive instruments.

About 150 watts are needed for receiving and a maximum of roughly 550 watts for transmitting. On the engine, power is furnished by the headlight's steam-driven generator. Storage batteries supply the current on the caboose and, in the station, the regular commercial power supply activates the transmitter.

W. R. Triem, the Pennsy's general superintendent of telegraph, describes the operation in this way:

"When the person in the station is talking, a current is continuously induced in the rails. This current is collected from the rails by receiver coils located under the locomotive cylinder and under the 'hack' or caboose. This current is then amplified and translated into voice reception.

"When someone on the train is talking, his telephone applies current impulse to the track, which induces current in the railroad's regular telephone line on poles bordering the track. Over this telephone wire, the impulse is carried to the station."

Does all this sound complicated? Well, to the railroad technicians the principle is simple and foolproof. Occasionally outside noises, caused by faulty transformers or sparking electric motors along the right of way, creep into the system. Seldom is the interference of such intensity that reception is impossible. The system definitely appears to perform better than static-susceptible radio.

One day G. R. Dunlap, who helped to godfather the Bel-Del installation, heard on the loudspeakers what sounded like a flyswatter swishing at mosquitoes which (Chambers of Commerce to the contrary) occasionally come up out of the Jersey swamps.

Carrying a radio-wave detection instrument, Dunlap started out to run the interference down. As he moved along the tracks, the gandy-dancers (track workers, to those unversed in railroad vernacular) looked on with wonderment at such strange doings on the old Bel-Del.

Dunlap, a quiet, philosophical sort of electrical engineer who left Bell Telephone Co. to handle a special assignment for the Pennsy and, somehow, never went back to his old job, finally found the trouble in a chicken hatchery's power plant. He insulated the offending machinery—and solved the trouble without disturbing a single hatching chick.

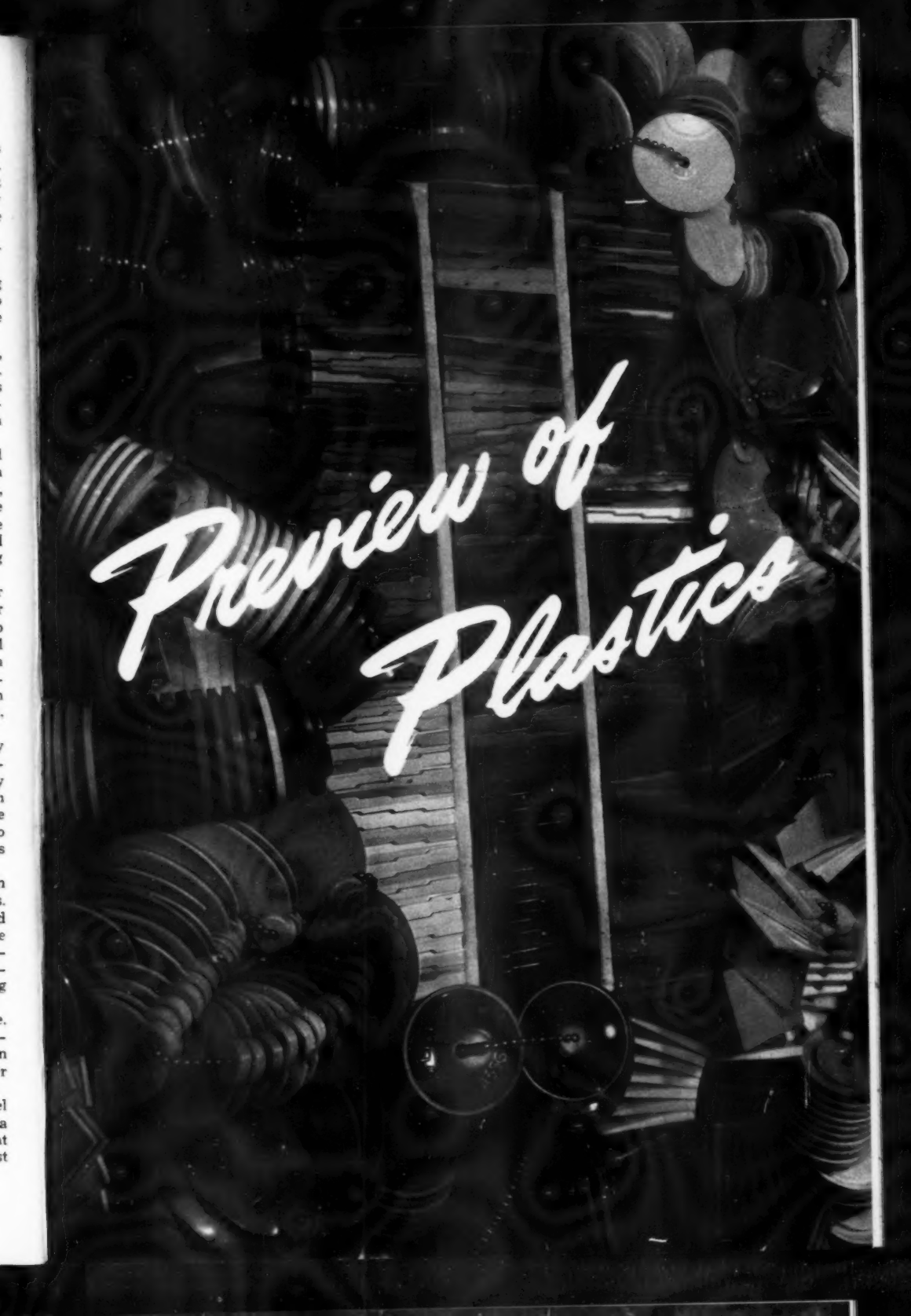
The transmitters and receivers are kept on for 24 hours a day. Every phone, just as in regular commercial hookups, has its own number. To reach this number, the person making the call pushes a button. This causes a loud buzzing on loudspeakers throughout the hookup. These buzzers vary for each phone: one for the Frenchtown station, for instance; two for some other point, three for another, and so on.

Of course everything is supposed to be strictly business. However, railroaders being the humanists that they are, an occasional bit of whimsy goes out over the air. One of the Frenchtown operators, W. P. Bird, has been known to squeeze in a word of family chatting with his son, who used to ride the caboose gig-tops when he was working on the Bel-Del.

To date, telephones have been installed on ten mikado-type freight locomotives and ten cabooses. Soon the Frenchtown tower will be supplemented by another at Trenton, further extending the working range of the transmitters, and the Pennsylvania has recently announced plans for equipping 300 locomotives on the Harrisburg-Pittsburg Division with train telephones.

Someday, it is not unreasonable to assume, business executives riding in speeding streamliners across the nation may be able to stay in direct communication with their offices no matter what the distance.

Whatever the future, the boys along the Bel-Del know that workin' on the railroad these days is a little more exciting, and motorists notice that grade crossings are no longer blocked by the last cars of freight trains.


Preview of
Plastics

One of the most versatile of all plastics is Du Pont's Nylon. Its uses are many even now, and the postwar period will see hosiery as only one of hundreds of Nylon products. Nylon is unaffected by practically anything, including heat, acids, alkalies and water. It is highly elastic and has a tensile strength of 6 tons per square inch! At left are a few present day Nylon products, some developed by war necessities. Included are paint brush, parachute harness webbing and shroud lines, glider tow rope, fabrics, molded bearing, carburetor diaphragms and surgical sutures (center).

by Josephine von Miklos

THERE is a new magic in the air and its name is Plastics. Some of our present-day industrial poets who present the visions of the future come pretty close to making us believe that we are about to enter the age of unlimited synthetics. They aren't far wrong.

Not all the words are new. We have heard about Lucite, Acetates, Resins, Beetleware, Bakelite caps, Nylon stockings before the war. We had been promised long ago that the twentieth century was to become the Plastic Age. But not in our wildest dreams did we then imagine that the war would bring about actualities such as plastic plumbing that does not corrode, plastic paint that lasts forever, plastic fabrics which need not be sent to the cleaner, plastic shoe soles which do not wear out, resin-bonded molded plywood airplanes and hundreds of other things which might, some day, come pretty close to pushing into the background many of the old standbys which have served us well for hundreds of years.

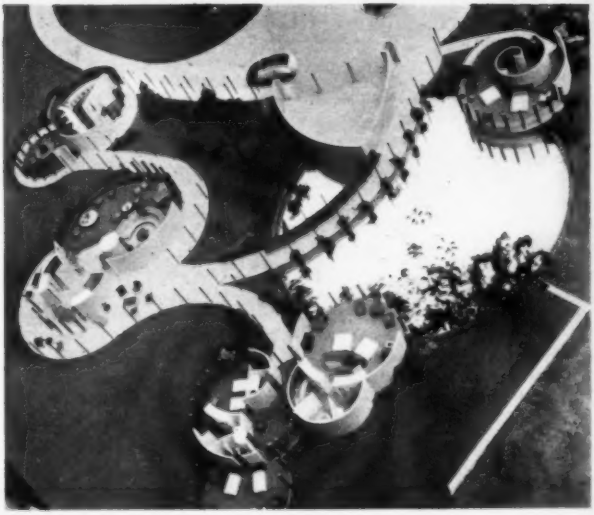
We knew, before the war, that certain plastics could be made in an unlimited range of color, and that there were some clearer than glass. Many plastics were unbreakable and tough, and for all practical purposes, ever-lasting. But we looked at even those amazing facts with not much more than a polite interest in chemical acrobatics, or thought of many of them as just promotional stunts with which modern merchandising was regaling a gullible public.

As in so many other new fields, war has brought sudden progress to the plastics industry which, in normal times, it might not have attained for many decades. There is only one word to describe this advance, and it is "fantastic."

Suddenly cut off from many of the raw materials which it used to have in abundance, American industry simply *had* to put its thinking cap on and find new ways to replace what we lost and expand that of which there was not enough to go around. The chemists, designers, engineers and tool-and-die makers went to work. They produced within an incredibly short space of time not only enough of the things with which to fight a war, but also laid the foundations for an amazing number of new things which, when the war is ended, will open entirely new ways of application and performance.

Model of a possible home of the future, to be constructed largely of plastics, designed by Alden B. Dow, Houston, Texas architect. Self-insulating walls are of translucent plastic in soft colors which will glow at night when lighted from within. Floors and many accessories are also plastic, including plumbing and kitchen equipment. All rooms are circular and connect by graceful, curved walks. Living room is near center (left), two of bedrooms face each other across lagoon.

Many of these new wartime plastics are still very much guarded secrets of the armed forces. Even the degree to which certain other materials are being replaced by certain plastics, is not yet fully known. But bit by bit we are being shown some of the new ways and some of the new ideas, and promises whose fulfillment is only waiting for the day of peace.



We can imagine, today, without fear of contradiction, that we will enter a house through a resin-impregnated door which will not warp or bend, is unaffected by weather and wear and has permanent color. We can visualize walking upon floors which do not wear or scuff . . . as architect Alden D. Dow says: " . . . in varying degrees of resiliency as well as in a variety of textures and colors. We should like to use them all through the building, having some floors that would be just right for dancing and others so soft that they would be comfortable to sit on" . . . At any rate, "houseworker fatigue" may then become a thing of the dim past. The venetian blinds in our dream house are plastic blinds, and

Plastics may well bring a needed postwar revolution in furniture design. At left is successful experimental chair made of Rohm & Haas' acrylic resin Plexiglas.

Plastics will be used in many ways to enhance the beauty of our postwar kitchens and will help to make them brighter and easier to clean. In this photo, Tenite plastic forms the trim of the sink and counter. It has low moisture absorption, can withstand hard knocks without chipping and its color will last.

plastic is the rope which draws them up and down. The light fixtures have plastic shades which give us a soft and even illumination our tired eyes have never had before. Our telephone dial shines in the dark, and so does, for that matter, our doorknob, and perhaps even the keyhole, for they are coated with or molded in luminous plastics. The curtains and the chair and couch covers are made of plastic fibre, and the walls are painted with non-fading, non-cracking, non-pealing plastic paint. Trim and moldings can be bought in many varying designs, in whatever color we wish to match to our walls.

Our dishes and the handles of our tableware might be made of plastics. They will be a thousand times better than any we have ever had before. The new dishes and handles can be washed in warm water without fear of damage. Our entire plumbing system will be made of plastic material—no more frozen pipes in the winter. Our window screens are plastic fiber; they can be washed and never need be removed. Wall insulation material is plastic and electric wires are insulated by plastics. We will have both wood and plastic furniture, held together with a new kind of glue which will be untouched by wear and temperature. The mountain climbers and the fishermen among us will use plastic rope and string . . . and our piano will be housed in low-pressure laminated wood which will no longer need polishing. Its surface will not be marred by the bottom of a highball glass which one of our guests carelessly sets down.

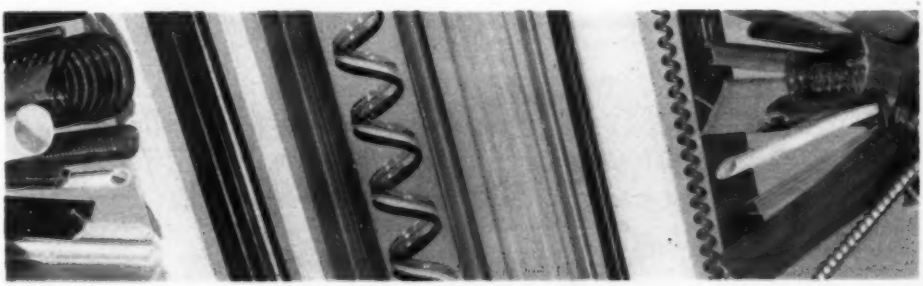
Of course, we will have Nylon stockings again and Nylon bristles and it will be a happy world for hogs and other bristle-bearing animals. Even paintbrushes will be made of Nylon. We will be clothed in ravishing grease resistant fabrics not woven from the silk worm's threads but designed in a chemist's retort. And we will drive in low-slung cars with transparent top and tough but

Here is a handy device which will be appreciated in every household—a Tenite plastic dustpan. It fits over the broom handle and is colorful, strong, more efficient and less abrasive than most metal types.

resilient new fenders who's contact with the garage door will be much less disastrous to both car and door.

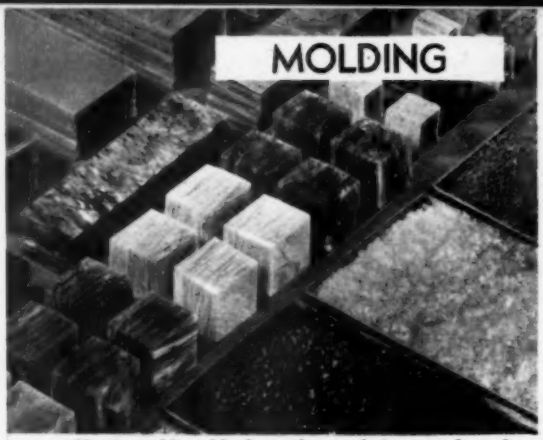
All these things and thousands more are possible; they are feasible, and what is more, they are on the way. So let's look at that plastic story and see what there is to it and behind it. Perhaps we can find some of the reasons for its incredible scope, and why it has grown in a few brief years into an industry that in 1943 produced 951,000,000 pounds of processed material valued at more than $362,000,000.

Generally speaking, plastics are chemically compounded materials which are formed, molded or cast, under heat and pressure to desired shapes. These plastics are divided into two major [*Continued on page* 76]



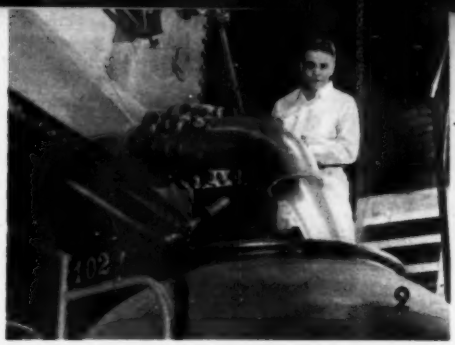
Plastic strips, rods and tubes in hundreds of different colors and cross sections will be used for such articles as woven furniture, table and shelf edgings, wall board joinings, insulation tubings and trimmings.

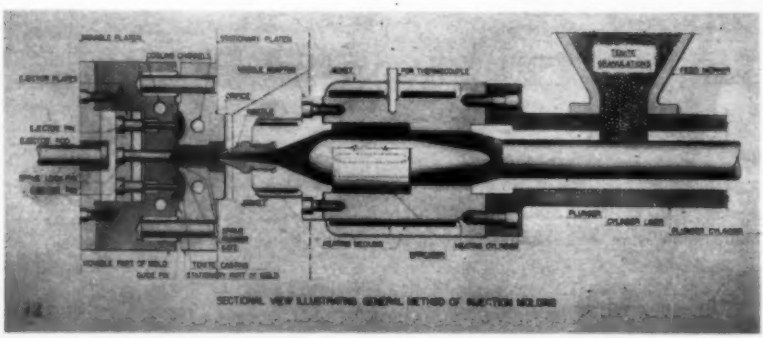
MOLDING



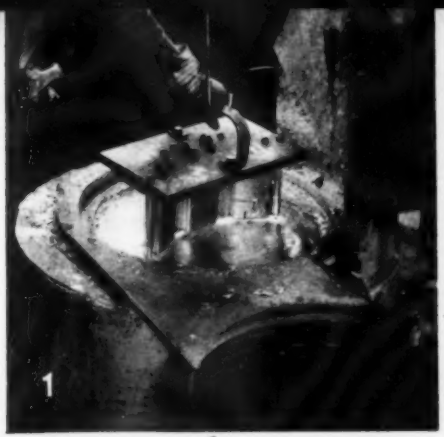
Plastic molding blanks and granulations ready to be fed into hopper of injection or compression molder.

A cellulose acetate, Tenite, like other thermoplastics is made in granular, sheet and blank forms for molding into a thousand things by the injection or compression process, or by extrusion. In each case the plastic is softened by heat, then shaped and hardened by cooling. Compression molding may be compared roughly to waffle making, extrusion to squeezing tooth paste from a tube. Photos show: 1—Plastic raw materials are dumped into reaction mixer. They consist of cotton linters, acids, catalysts. 2—Mixer (acetylator) pours out resulting substance—cellulose acetate. 3—Acetate is ripened in jars. 4—After water processing and drying, plastic appears as flakes and cakes.

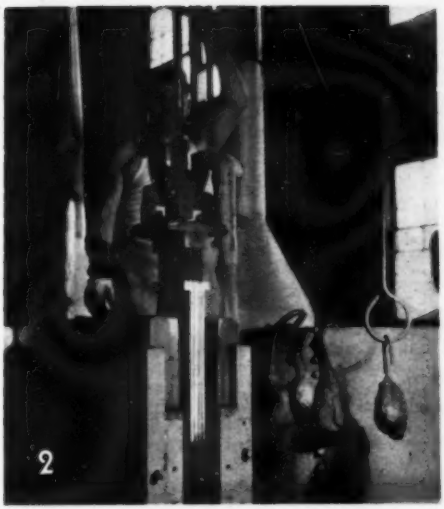




Injection molding is faster and more economical than compression molding when complicated pieces are to be made. Briefly, the process involves feeding plastic material into a cylinder, where it is heated and then forced through a nozzle into cavities of a chilled mold. Here it hardens quickly.

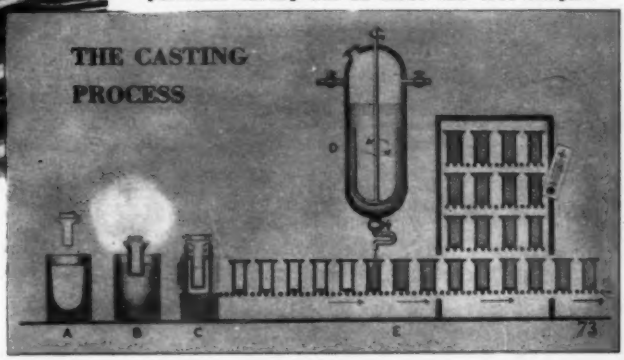


Water pump gears of die-cast plastic with metal insert.



Thermosetting phenolic resins, such as Catalin, may be cast in liquid form in molds of the split or draw type, much like Junior's toy soldiers. They are hard and tough, cannot be resoftened once set, have many industrial uses. Most phenolic castings are cured in straight draw molds, as illustrated here. Photos show: 1—Steel duplicate (mandrel) of casting-to-be is dipped in molten lead bath. Lead creeps up sides of mandrel, cools on removal from pot. 2—Lead shell is stripped from mandrel, producing open mold. This is different mandrel from first photo. 3—Liquid plastic is poured in mold to cure. 4—After curing, casting is knocked from mold by pneumatic hammer. This particular casting will be sliced into coat hangers.

Right: (A) Mandrel dipped in lead. (B) Lead creeps up sides. (C) Cold mold vibrated from mandrel. (D) Tank of liquid plastic fills molds (E), which are cured in large ovens.

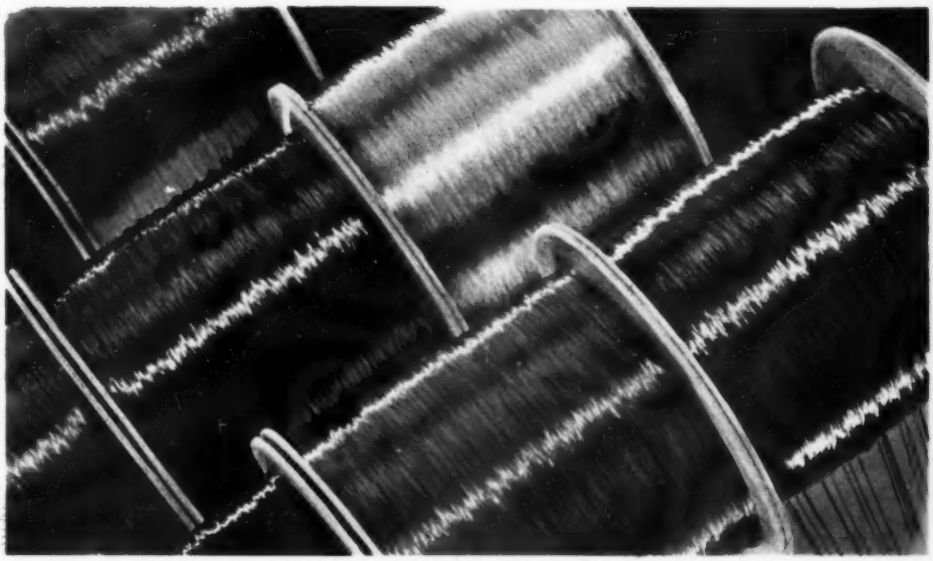


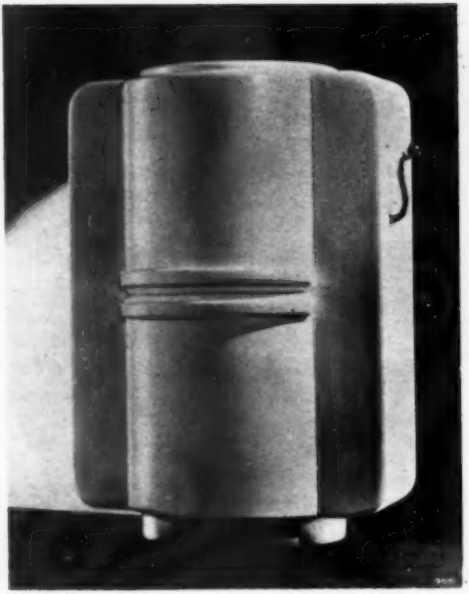
Plastic football helmets were used for a short time before the war, will appear extensively afterwards. Paratroopers have found them excellent shock protection. Below: Combined with Catalin liquid resins, paper, cloth, wood veneer, cork, abrasives and other materials become a long list of superlative products.

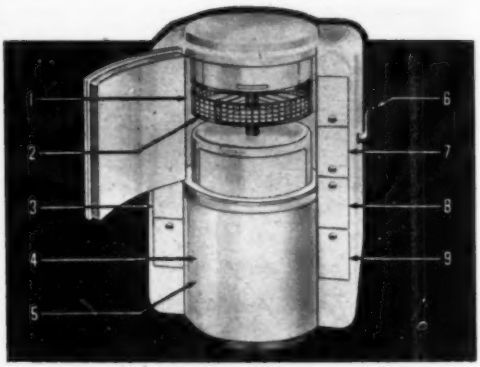
Tenite and other thermoplastic molding materials can be extruded by heat and pressure into continuous lengths of innumerable shapes. This "toothpaste" plastic will find extensive peacetime use as wall molding, decorative trim, edgings and tubing of all types. Your garden hose may be manufactured like this.

Milady in her new home may hang her spun plastic gown on clever and colorful plastic coat hangers suspended from a clean, transparent extruded plastic closet pole. These hangers, unlike the cast, thermo-setting hangers shown in manufacture on page 73, are injection molded, can be made in any desired color.

Many plastics, such as Nylon, Tenite and the new Saran can be produced in strands, threads or fibers of amazing strength, beauty and durability. Fabrics, rope, screens, fish lines, hosiery and other products woven from these filaments are resistant to water, weather, chemicals, climate and are easily cleaned.







Light weight and smooth lines are among the keynotes of Durez' resin-bonded plywood refrigerator shown at left, designed by Egmont Arens. Plywood's outer skin is Durez plastic. Above: (1) General refrigeration compartment. (2) Easy-to-reach revolving shelves. (3) Cooling drawer for tall bottles. (4) Lower half for frozen foods, kept at 10° F. or lower. (5) Violet-ray compartment for sterilizing and tenderizing meats. (6) Ice cube ejector lever. (7) Ice cubes drop into this drawer for easy removal. (8) Cold water faucet in this drawer for instant ice water supply.

[*Continued from page* 71]

groups: the thermosetting and thermoplastic types of materials.

The thermosetting types consist of base chemicals and "filler" material which undergo a reaction during proper application of heat and pressure. When the proper process of manufacture is finished, a new material of permanent definition is the result. Heat cannot alter or resoften the material. Chemicals which might have had certain effects before, can now no longer bring about a change.

The thermoplastic materials, on the other hand, are of such a nature that they may be reheated and remolded again and again. There is no chemical change in the material during the molding process. The same chemicals which affect the basic material will therefore continue to affect the finished product.

J. H. Dubois of the Plastics Department of the General Electric Company makes a very simple and clear definition of these two kinds of plastics in his book *Plastics*: He says:

"The thermosetting compounds may be compared with concrete. Concrete is a mixture of cement and sand which has been hardened by a chemical reaction in the presence of water. The cement may be said to be a binder for the sand. The sand serves as a filler . . . providing body and substance to resist dimensional changes. A chemical change takes place when the cement 'sets,' producing a solid body. The change is permanent; the resulting solid substance retains the form in which it was cast and cured.

"In a typical plastics material such as a phenol-formaldehyde compound, the analogy with concrete provides an excellent means for understanding the thermosetting reaction. In this case the binder of 'cement' is a chemically produced resin resulting from a partial union of the phenol and formaldehyde. The phenol-formaldehyde resin is mixed with a filler such as powdered wood, and this compound is then pressed to shape in heated dies. The combination of heat and pressure on the compound in the mold causes it to become plastic and to flow and fill out the desired contours of the molded part. Continued heat and pressure completes the chemical union of the phenol and formaldehyde, and the filler particles are bonded into a unit mass while held in compression. The binder has welded the particles of filler into a single mass which cannot be softened again by heat. It now resists chemicals which would have dissolved the resin before it has passed through the thermosetting reaction in the mold.

"The thermoplastic materials can be understood when considered as similar to sealing wax. Sealing wax is a dense, hard substance at room temperature. When it is heated, it becomes soft and pliable and may be molded. When this shaped or molded way again cools to normal temperatures, it becomes dense and hard again and retains the newly formed

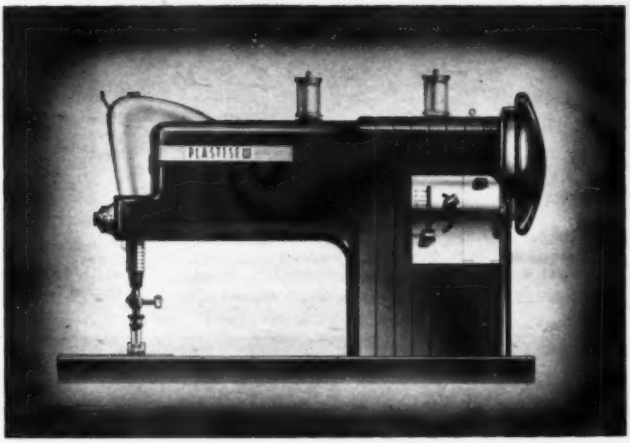
shape. Unlike the thermosetting resins, these thermoplastic materials may undergo this softening by heating and hardening by cooling again and again. Since there has been no chemical change in the thermosplastic material during the heating and cooling cycle of molding, the same chemicals which would attack it before molding will still attack it after molding. The injection-molded or thermoplastic materials are generally of unit chemical composition without the fillers used in the thermosetting compounds."

In addition to these two most important types of plastics which are formed under heat and pressure into the finished items you and I use, there are also the so-called cold molded plastics. These are mixed, cured and baked in non-heated molds. Depending on whether organic or inorganic fillers are used in their mixture, they are called non-refractory or refractory plastics and used almost exclusively for electrical applications.

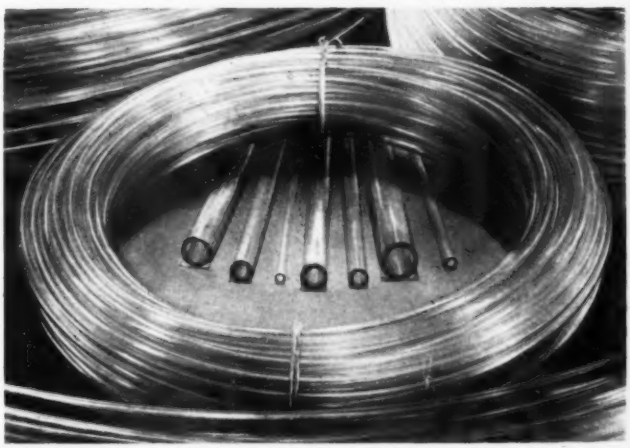
There are also the cast plastics which are of particular importance to mechanics because, like metal they can be machined. Thermoplastics can also be machined; but it is the cast materials which give designers, model makers and home workshop people unlimited scope. They are made much in the same way any other cast material is made: the liquid material . . . resin is the word . . . are poured into certain forms, baked and cured until the desired properties are obtained.

As far as the molding of plastics goes, there are several methods in use. Or, perhaps, we should put it this way: depending on the kind

Electrically operated plastic typewriter above designed by industrial designer Dave Chapman for Durex. This post-war model includes advantages of quietness, light weight and maximum ease of operation.



Simply conceived, Peter Muller-Munk's design for post-war Durex sewing machine above also has eye appeal, is light and durable. Transparent plastic tubing below can be used for home plumbing.

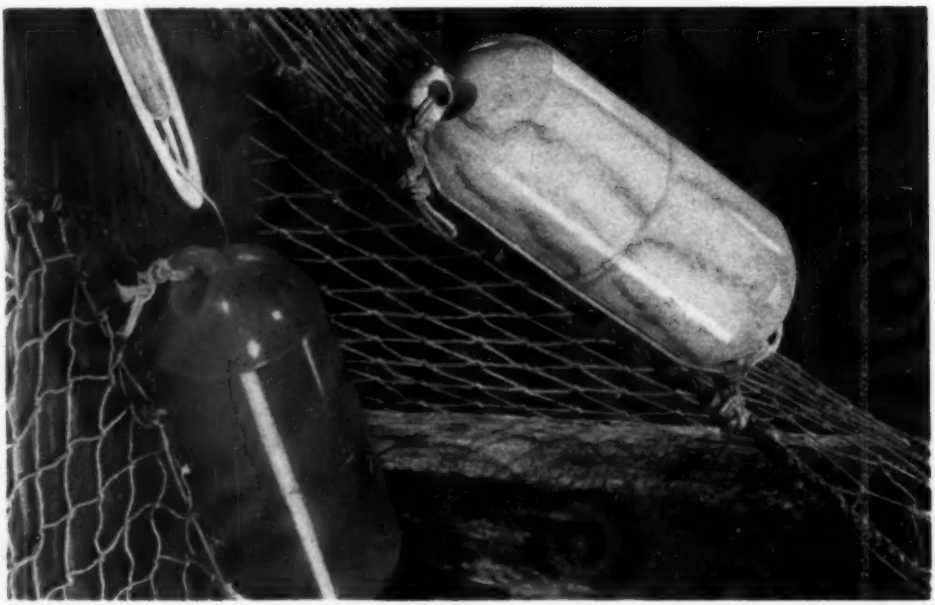


Transportation facilities will feel the influence of new plastics. Bus shades and fittings and train accessories (above) will be made of this material. Even the fishnets floats below are made of waterproof plastic.

of material to be used, and also the shape to be made, one or the other molding method is employed. Thermosetting materials are usually cast or compression molded, although, of late, they can also be injection molded; thermoplastics are injection molded, compression molded or extruded. Compression molding is a process by which the plastic compound is pressed into a heated mold under very great pressure. In injection molding, the hot liquid material is injected through nozzles into chilled molds. Extrusion means that the material is forced through an opening in a die, coming out of it ribbon-like in the shape of the die opening.

All of this sounds, perhaps, simple enough. It is possible to understand such terms as compression, injection, heat, pressure, die. We can comprehend that liquid resins may be combined with other materials . . . "plasticising" . . . of wood, for instance, or that several layers of various materials can be combined in what we know as the laminating process. We have used laminated table tops for quite some time; we have seen cellophane laminated to cardboard and so on.

But where the miracle comes in and the overwhelming wonder is the basic chemistry which compounds these various plastic materials and finds formulae which apply to thousands of finely differentiated



In footwear, plastic has its uses, also. Beautiful colors, spun into thread and woven into gay designs, offer something distinctly different and even more attractive and serviceable than prewar models.

Plastic gadgets of all types will be many and varied. Below is a unique and colorful device which can be used to advantage at the beach; it holds your book or magazine free from the sand while you read.

These Plastics Will Become Part Of Your Postwar Life

Technical Name	Trade Name	Origin	Fabrication	Uses In War And Peace
Phenolics	Bakelite Durite Formica Marbiette Catalin, Etc.	Carbolic Acid, Formaldehyde	Can Be Molded, Laminated, Cast. "All-Around Plastic"	Fuses, Tank Parts, Rifle Grips, Hand Grenades, Land Mines, Optical Equipment, Camera Cases, Hearing Aids, Telephone Equipment, Clock Cases
Urea	Bakelite Plaskon Beetle, Etc.	Ammonia, Carbon-Dioxide	Can Be Molded, Laminated; Resin Bonded	Meteorological Instruments, Buttons, Tableware, Instrument Dials And Knobs. Adhesives, Plywood Bonds
Melamine	Catalin Melmac Plaskon	Cyanamide, Dicyandiamide	Can Be Molded, Laminated	Tableware, Buttons, Telephone Handsets, Electrical Parts, Adhesive For Plywood, Bond For Paper, Wood
Analine	Cibanite Dilectene	Formaldehyde, Amines	Can Be Molded, Machined	Radio And Television Equipment, Aircraft Parts, Insulators
Lignin	Benalite Lignolite	Waste Wood Pulp	Laminated, Can Be Machined	Electrical Insulation Parts, Foundry Pattern Plates, Signs, Ice Boxes
Vinyl	Vinylite Koron Saran Saflex, Etc.	Acetic Acid, Acetylene Gas	Resin Bonded	Rigid Sheets, Laminating Film, Fabric, Tubing, Safety Glass, Cloth Coatings, Life Rafts, Instrument Housings, Fish Lines
Nylon	Nylon	Coal, Air, Water	Molding Powder	Hosiery, Parachutes, Racket Strings, Surgical Sutures, Toothbrushes, Rope
Cellulose Compounds	Bakelite Lumarith Tenite Celluloid, Etc.	Cotton Treated With Acid Or Sodium Hydroxide	Molded, Can Be Machined	Respirator Parts, Whistles, Bayonet Scabbards, First Aid Kits, Helmets, Bottles, Costume Jewelry, Telephones
Acrylic	Plexiglass Lucite Acryloid	Petroleum, Coal, Air, Water	Molded, Cast; Excellent For Machining	Dentures, Windows, Windshields, Reflectors, Lenses, Gun Turrets, Roller Bearings, Artificial Eyes

performances. One of the most important factors in the making of plastics is that they are, for a large part, made of inexhaustible matter, such as water, air, coal and many plants which grow in abundance and are available at low cost. But air, coal, water and plants are by no means the whole story. Just to give you a couple of examples of the complicated chemical consistency of some plastics, here are the things which make two of the most famous plastics, Nylon and Plexiglas:

Nylon consists of: Phenol, Cyclohexanol, Adipamide, Adipic Acid, Hexamethylene Diamine; Plexiglas: Acetone, Acetone Cyanohydrin, Methanol, Methyl Methacrylate. Of course, that doesn't really mean anything to anybody except a plastic chemist; but these formidable terms do give us an impression of the super science which goes into the making of these things.

Due to the fact of practically limitless chemical variations, there is, in theory at least, practically nothing that plastics cannot do.

But right here is the point where we must begin to check our enthusiasm and admit that it would be rather foolish to assume that plastics can do everything, or that there is any one plastic which can perform every duty which might be demanded of some plastics. If, in the thermosetting group, for instance, wood flour is used for a filler, we'll get a very good and tough general purpose material; but if we

Catalin is easily machined in the home workshop with ordinary power tools. The chessmen at left are turned smoothly with woodworking chisels. Note long chip.

Mechanix Illustrated

use chopped cloth we'll have something which is much more resistant to shock. Asbestos filled materials give us heat resistance, powdered mica, dimensional stability, and low moisture absorbtion, and graphite minimum friction.

But if you want a flexible material, for instance, you couldn't use any of those things with fillers and would have to go to something like an acetate or polyvinyl acetate . . . thermoplastics . . . and then you would also have the kind of color you could not get in some of the other, tougher thermosetting materials. For toothbrush handles, goggle frames, pen sockets, combs, cosmetic containers you would choose something like Vinylite resins; for collapsible tubes . . . incidentally, the plastic manufacture of collapsible plastic tubes has released 2,200,000 pounds of tin a year . . . plastic zippers, razors, flashlights, spatulae, you might choose something like Lumarith. But for the housing of a radio, or some electrical appliances, you would want a phenolic, like Bakelite.

If, for some reason you are very fussy about dyes, you can go to DuPont and they'll give you the choice of 220 shades of blue plastic dyes alone.

What you have to know is that some plastics are harder than others. Phenolics are harder than acetates. Nylon is exceptionally tough, especially where sections must be thin and of great strength. Nylon here might do a job impossible for other plastics, or, perhaps, for any other material. An enthusiastic observer, according to DuPont, wrote recently: "One military nylon molding, for example, looks something like a tiny wooden matchbox, except that the sections are thinner and it looks far more fragile. But you can step on it . . . and though it gives somewhat, it comes right back to its former shape."

Some plastics can be made in an unlimited range of colors, such as

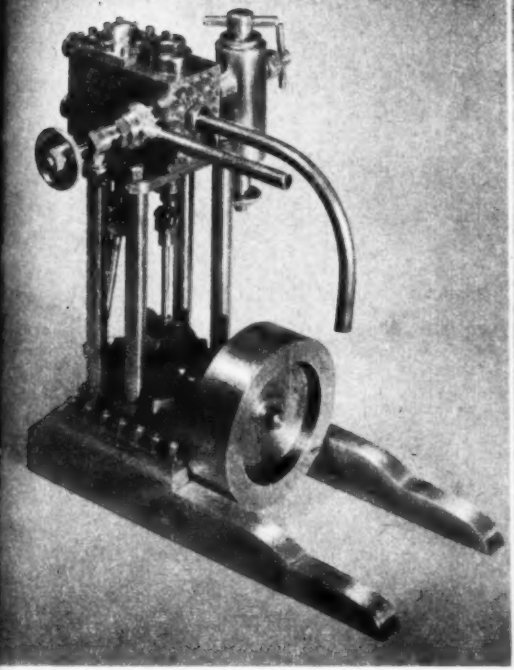
Transparent plastic model of Bethlehem-Fairfield Shipyard Victory Ship shows all structural details easily and clearly. Gleaming rows of Plexiglas "bubbles" below are specially formed for top optical properties, give bomber plane crews improved rear vision in flight.

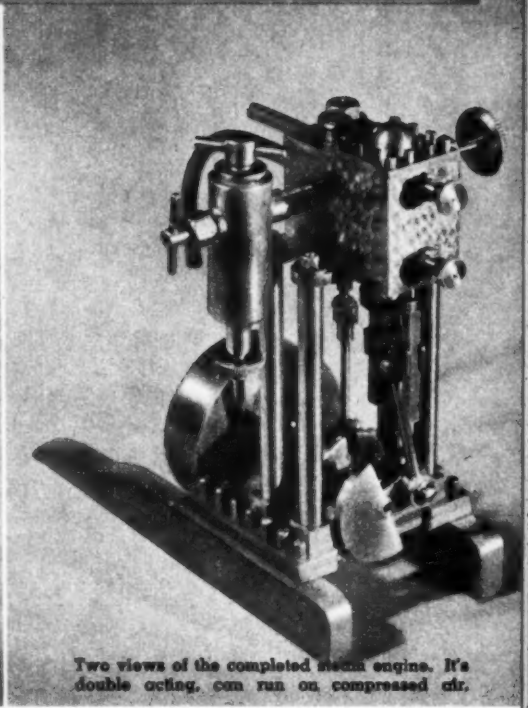
the various kinds of acetates, acrylics, urea, vinyl plastics; others, like the phenol formaldehyde materials (phenolics) can only be made in dark color. Some may be affected by aromatic oils, as is Catalin, but Saran, which is a much newer material, seems not to be. Saran (a vinyl derivative), is a stiff material with very low moisture absorption, good dimensional stability and high chemical resistance, and therefore excellent for things like plumbing. A polyvinil acetate like koroseal is good for household wiring, alkali-proof bathtub sealing strips, hardware handles, floor matting, architectural trim, and it has unlimited color possibilities. Plexiglas and Lucite are technically called acrylics, and are most desirable when lightweight, shatterproof, impact resistant optically advantageous applications are indicated. War finds them needed for the noses of our bombers, but they will find many related uses in normal times.

Dr. D. S. Fredericks, Vice-President of Rohm & Haas Corp. Philadelphia, Penn.: "Post war cars will have curved Plexiglass [*Continued on page* 146]

Plastic castings, such as these, can be produced in only a few seconds by the rapid injection-molding process. Scrap pieces can be fed back to the cylinder for re-use.

CRAFTS AND HOBBIES





Two views of the completed steam engine. It's double acting, can run on compressed air.

Model Steam Engine

No castings needed to make this fine little steam power plant—it can be built entirely of stock pieces of metal on your lathe.

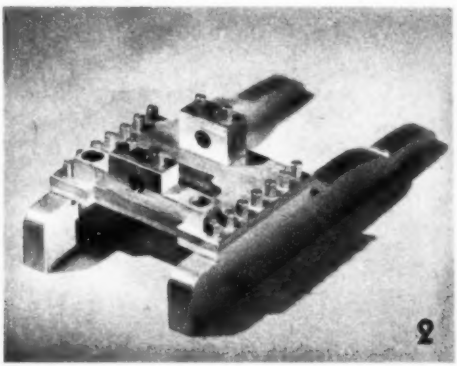
by C. W. Woodson

TO THE man who has so fondly admired the picturesque steam engine of days gone by, and who still has the long pent up desire to build a working model of one of these fascinating old time power plants, this engine will have great appeal. While not a scale model of any particular old time engine it represents, in general, the marine type used in many small tugs, steam launches and other pleasure craft so popular at the turn of the century. Being double acting it can be slowed down to any desired speed, but with plenty of steam in the boiler it will be a lively little fellow that can really turn over the r.p.m.'s.

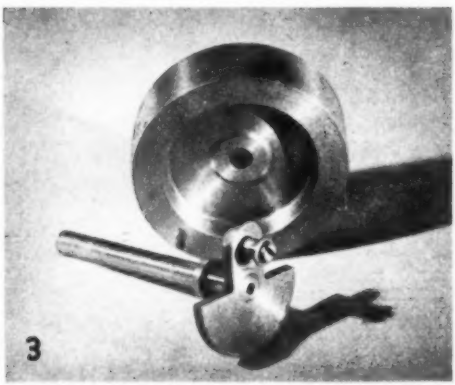
Built entirely from odds and ends found around the shop it will be quite inexpensive, although it will require patience and work for its construction. There are a great many operations on even so simple a model as this and much of the work will be of the precision type. A number of its parts must be held to very close tolerances if the engine is to perform as well as you will wish it to. However, the amateur who is master of his lathe should have no trouble in constructing a fine working model. The drawings clearly show every detail while the photos picture a number of machining operations and all of the parts in the various stages of assembly as well. Here, then, is an engine for the home mechanic to build. A worthwhile project which will furnish many hours of relaxation and one which will afford the satisfying feeling of accomplishment that goes hand in hand with fine craftsmanship.

After studying the drawings to get ac-

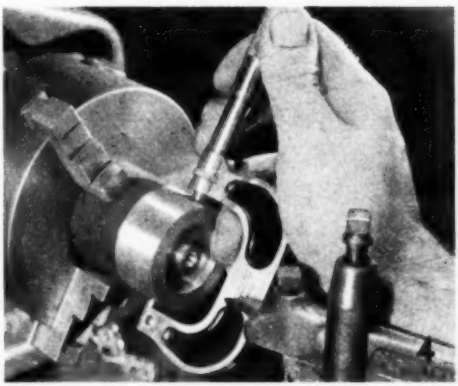
Engine bed, of brass plate, is drilled in drill press.



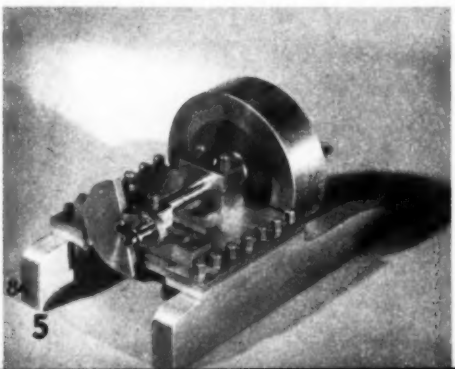
Bearings in place on base, where they are reamed.

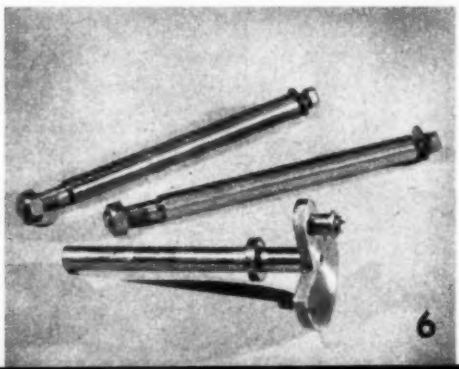


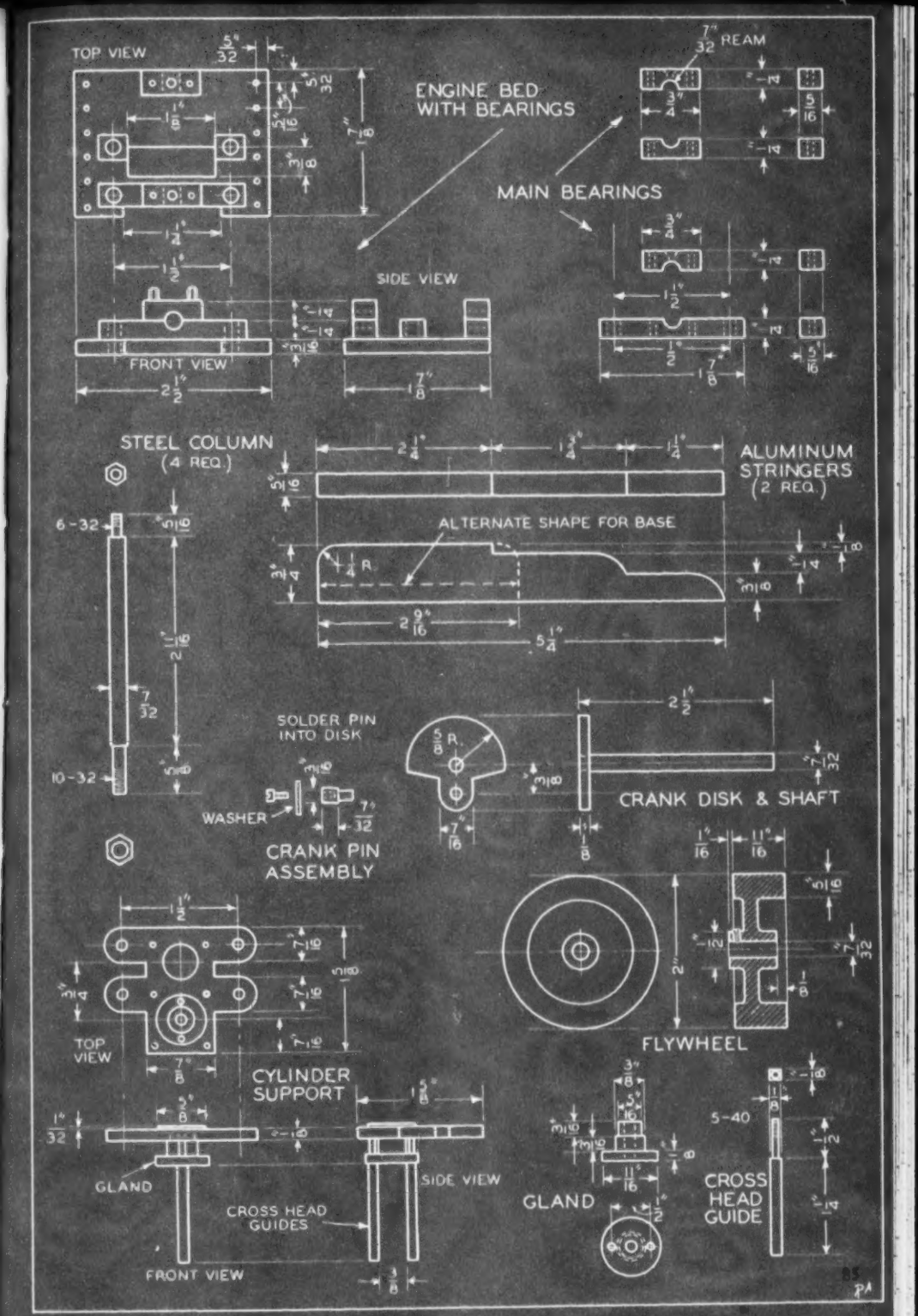
Crank disc, shaft and flywheel as they appear finished. Below: Shaft, with flywheel attached, in bearings.



Flywheel, chucked in lathe, is measured for accuracy. Below: Front cylinder support columns, threaded.





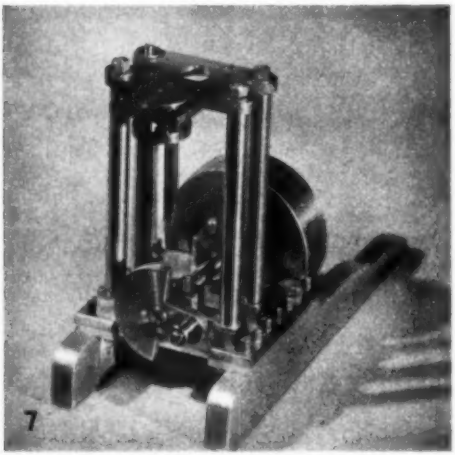

TOP VIEW
ENGINE BED WITH BEARINGS
7/32" REAM
MAIN BEARINGS
SIDE VIEW
FRONT VIEW
STEEL COLUMN (4 REQ.)
6-32
10-32
ALUMINUM STRINGERS (2 REQ.)
ALTERNATE SHAPE FOR BASE
SOLDER PIN INTO DISK
WASHER
CRANK PIN ASSEMBLY
CRANK DISK & SHAFT
FLYWHEEL
TOP VIEW
CYLINDER SUPPORT
GLAND
CROSS HEAD GUIDES
SIDE VIEW
FRONT VIEW
GLAND
5-40
CROSS HEAD GUIDE

quainted with the different parts and working of the little engine, actual machining can begin. The base seems to be the logical part to turn out first. Take the dimensions of the bed from the drawings; they are carefully laid out on a suitable piece of brass plate, cut accurately to size, with the various holes drilled as shown in Fig. 1, and the large opening, for eccentric sheave clearance, drilled and filed to shape.

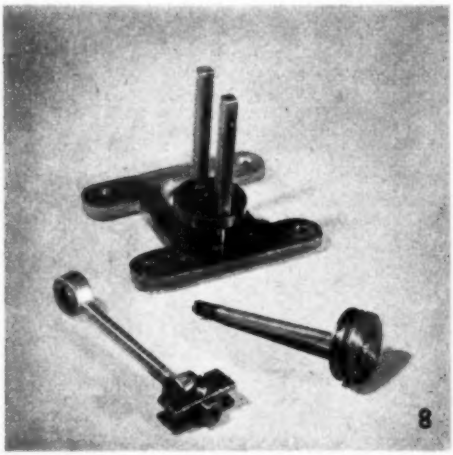
The stringers are made up from aluminum plate to the dimensions indicated in the drawings. With the bed clamped in place on the stringers the screw holes are drilled through both parts to align them perfectly for fastening together. The parts can then be polished with fine emery cloth or on the buffing wheel. If the long streamline stringers are not wanted they can be cut short.

The main bearings are simply made from brass bar stock with screw holes drilled and tapped for fastening the upper and lower parts together. The shaft hole can then be drilled, slightly undersize, through these parts before assembly. When firmly fastened to the base, Fig. 2, a reamer is run through both bearings at the same time to accurately align the shaft hole so there will be no binding at this point.

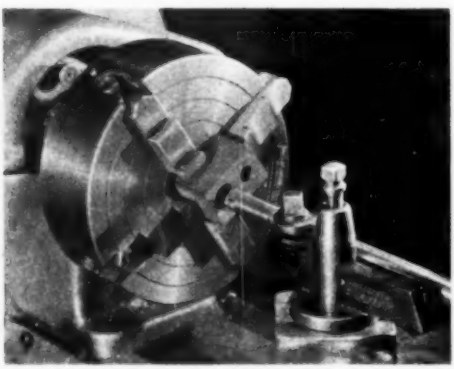
The crank disc is made of mild steel, turned to ⅛" in thickness, sawed and filed to shape and drilled as indicated in the drawings. The crankpin is made up from drillrod and riveted to the disc as is the crankshaft, which is shouldered down slightly on one end and riveted in place on the opposite side from the crankpin. The dimensions are all detailed in the drawings, while the finished crank disc and shaft are shown in the photo, Fig. 3, and also in Fig. 5. Here the spacer is shown slipped onto the shaft.



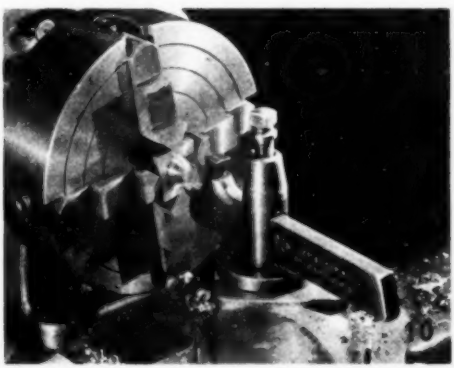
Cylinder cover and columns assembled on engine bed.



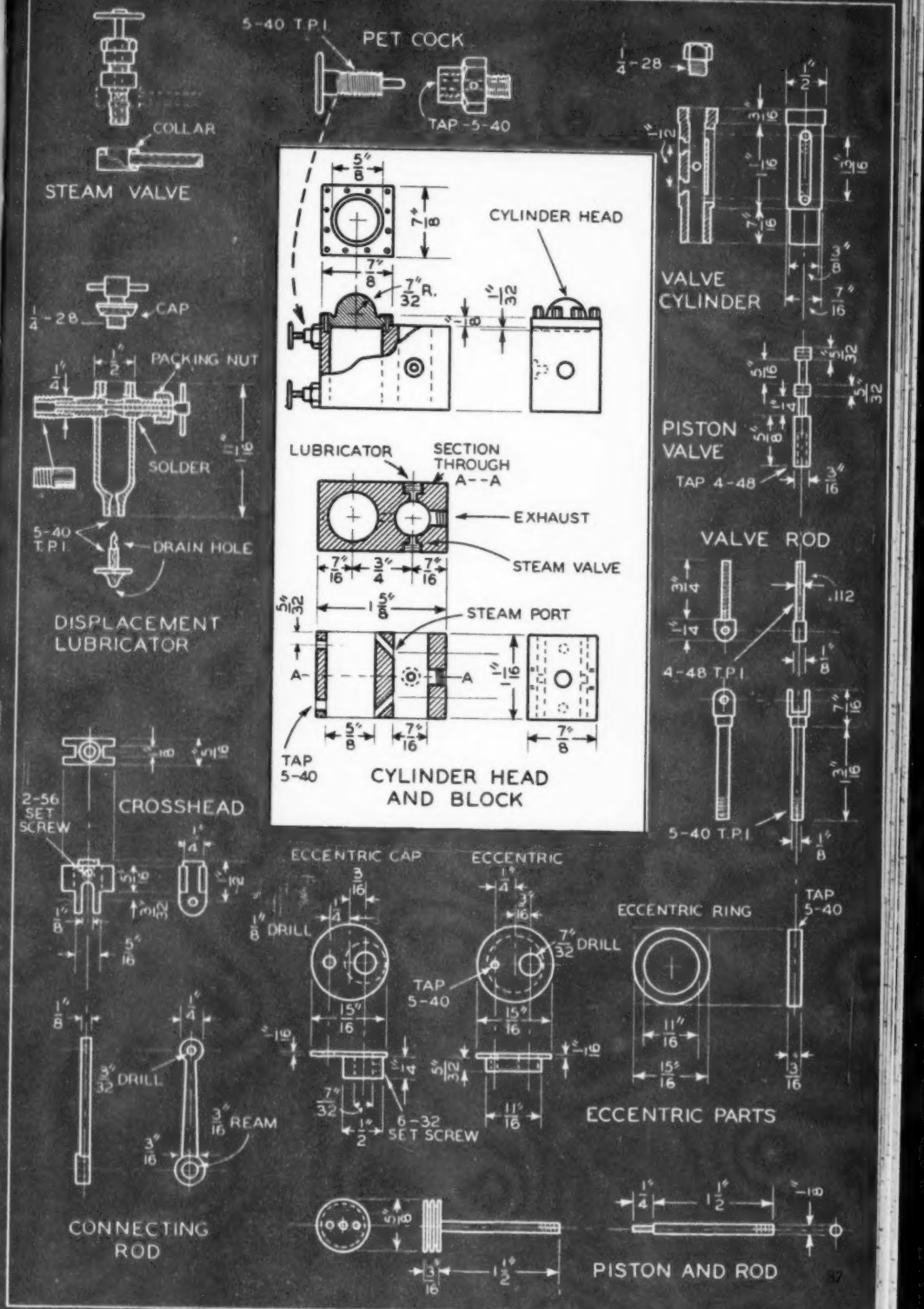
Assembly parts: cover, gland, piston, rod, cross head.



Cast iron cylinder block is drilled in 4-jaw chuck.



Cylinder head, of brass, is also machined in lathe.


5-40 T.P.I
PET COCK
TAP -5-40
COLLAR
STEAM VALVE
CAP
PACKING NUT
SOLDER
DRAIN HOLE
DISPLACEMENT LUBRICATOR
CYLINDER HEAD
LUBRICATOR
SECTION THROUGH A--A
EXHAUST
STEAM VALVE
STEAM PORT
TAP 5-40
CYLINDER HEAD AND BLOCK
VALVE CYLINDER
PISTON VALVE
TAP 4-48
VALVE ROD
4-48 T.P.I
5-40 T.P.I
CROSSHEAD
2-56 SET SCREW
ECCENTRIC CAP
ECCENTRIC
DRILL
TAP 5-40
ECCENTRIC RING
ECCENTRIC PARTS
CONNECTING ROD
REAM
6-32 SET SCREW
PISTON AND ROD

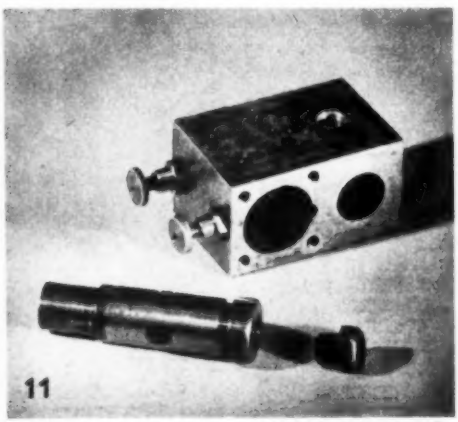
Here's the actual operation of boring the cylinder block. Boring bar is held in cross slide and block in chuck, turning at slow speed while cutter works.

The flywheel, also shown in Fig. 3, can be turned from most any metal; bronze, steel or cast iron. Care should be used in turning the rim and drilling the shaft hole to make them concentric with each other. It is most important that the flywheel run dead true. This was accomplished by turning one side completely and drilling the shaft hole at the same chucking, Fig. 4. The work was then cut off, reversed in the chuck and the opposite side turned to shape. The hub, on the bearing side, is drilled and tapped for a small hardened setscrew which holds the flywheel securely to the crankshaft. Fig. 5 shows the bearings, flywheel and crankshaft mounted on the engine bed ready for the columns to be put in place.

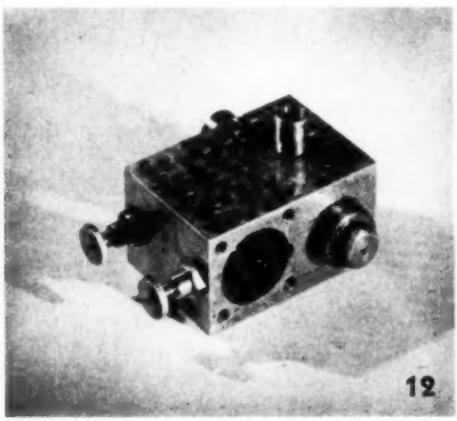
The columns are made from 7/32" drillrod shouldered down on one end and threaded to screw into the base. The front pair, Fig. 6, slip through the ends of the main bearings holding them securely. In Fig. 7, the columns are in place and the various parts thus far completed take on the appearance of a fine little engine.

The lower cylinder cover is made up from 5/32" brass plate. The various holes are laid out and drilled, the part cut to proper size and filed smoothly and accurately to shape. The piston rod gland, which is part of the assembly, is made up separately, to the dimensions in the drawings, and riveted in place. This can be used as a chucking lug for turning the cylinder cover to⅛" in thickness. Exception is the ⅝" disc directly above the gland for locating the cylinder and making a steam-tight joint. The piston rod hole should be drilled at this same chucking to make it concentric with the disc and to center the piston accurately in the cylinder. The gland also acts as a mount for the cross head guide bars. These are short lengths of ⅛" square steel rod shouldered down on one end, threaded, as shown in the drawings, and screwed tightly in place into the tapped holes in the cylinder cover. The complete assembly is shown in Fig. 7, while the photo, Fig. 8, shows a close-up of the parts.

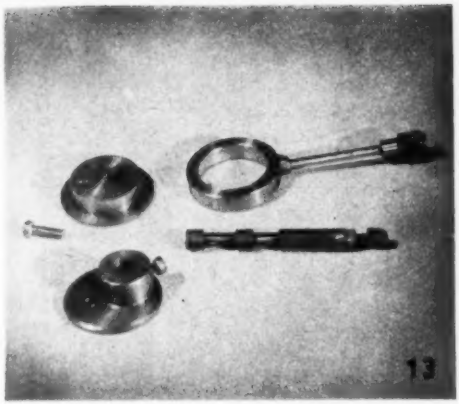
The cylinder block, including the valve



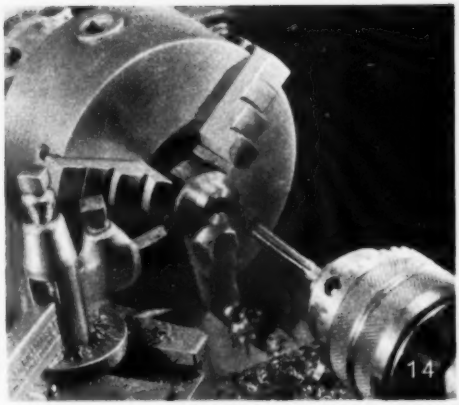
Completed cylinder block and the valve chamber.



Valve chamber, a driving fit, is pressed in place.



Piston valve is made from drill rod. Note oil grooves. Eccentric and eccentric sheave are also shown here.

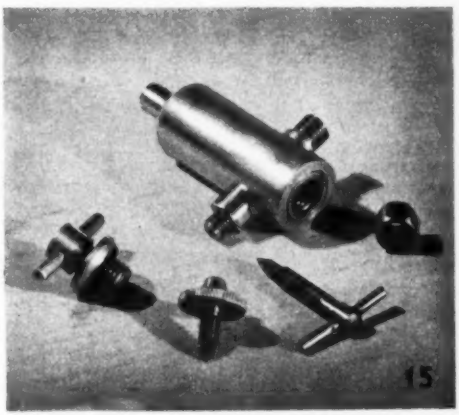


Piece of flat 3/16" steel placed in one of chuck jaws offsets eccentric enough for correct operating throw.

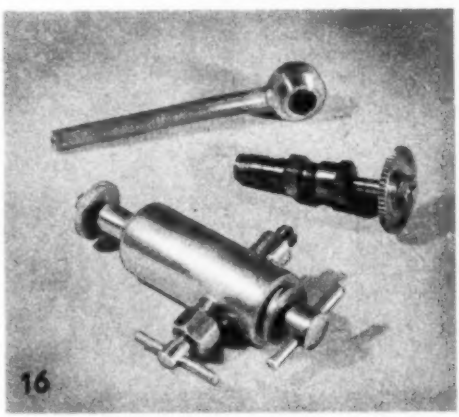
chamber, is made from a small piece of cast iron. It can be squared up in the shaper or in the lathe while chucked in the four-jaw, Fig. 9, where the cylinder and valve holes are drilled and accurately bored to size. The steam ports are best drilled in the drill press with the work held in an angle vise. Carefully lay out the holes for the exhaust, lubricator and steam valve. They are then drilled and tapped, as are the two small holes for the drain cocks.

The cylinder head is made up from a small block of brass, accurately cut and squared to the size indicated. Turn it to shape while mounted in the four-jaw chuck, Fig. 10. The screw holes are carefully laid out, prick-punched and drilled while the head is clamped in place on the cylinder block.

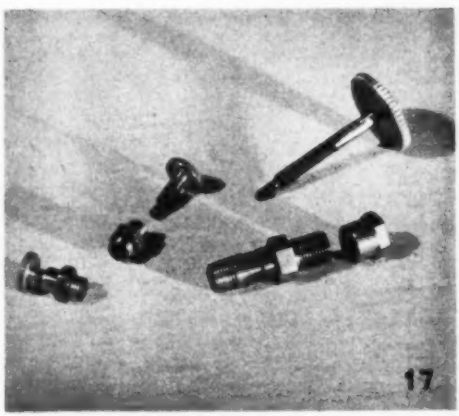
The piston is machined from a short piece of cast iron rod to [*Continued on page* 132]



Lubricator shell, cap, needle valve and drain valve.



Lubricator valve, steam valve and pipe collar.

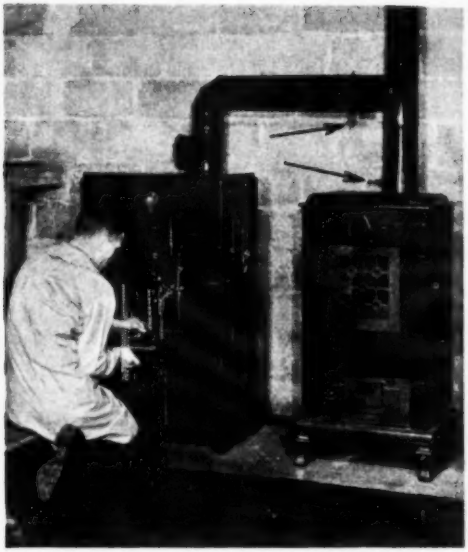


Steam valve components and two petcocks.

HOME AND SHOP IDEAS

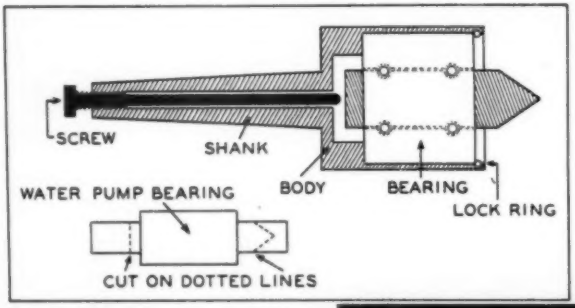
Locating Spotted Areas

BEFORE washing a dark-colored garment, circle stained areas with white thread. When material is wet spots can be located.



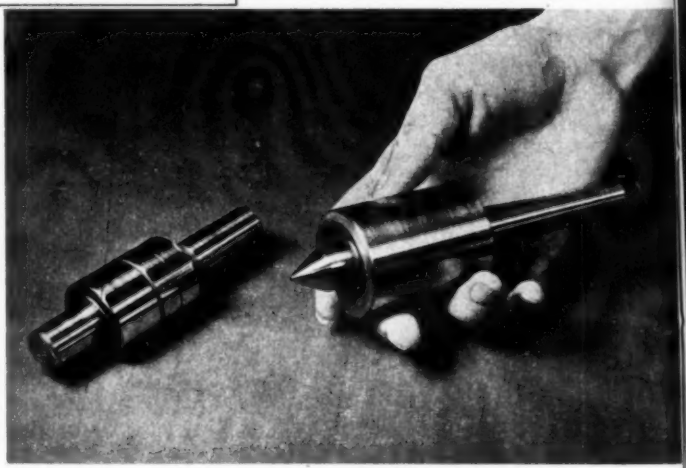
Two-Stove Heating Plant

BECAUSE he is able to burn coal more economically than oil during working hours when steady heat is needed, the garage owner-operator of this two-stove heating plant fires the coal at that time. Overnight and week ends, he runs the oil stove. Both are connected to the same flue, eliminating starting difficulties since stack is always warm. Full closing dampers (shown by arrows) prevent interference by either stove when the other is being operated.



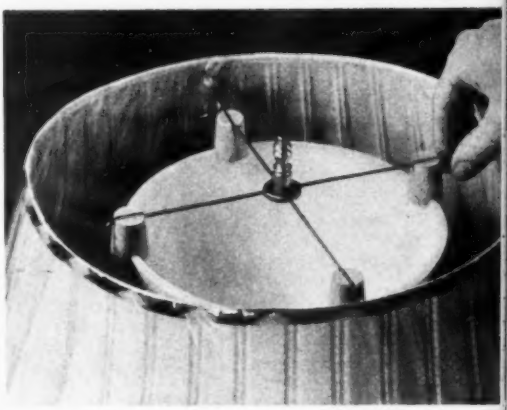
Live Center

A SUBSTANTIAL live center for your lathe can be made from the bearing of a late model Chevrolet water pump. Housing is turned from 1¾" shafting. Shank can be taken from a discarded drill, or can be turned. Bearing should be pressed into the body. A lock ring is provided to hold bearing in place. Put a screw in the shank to hold the bearing shaft while turning point, insuring an accurate center. Taper on shank must be made to fit your lathe.



Lamp Shade Locker

ONE of the most irritating of minor household annoyances is a wobbly floor lamp shade that refuses to stay straight. With the aid of four corks, however, you can keep any lamp shade securely in place. Slot top and bottom of corks, press them on reflector rim and also on shade's wire supports.



Small Cigarette Humidor

THE colorfully decorated glasses in which spread cheese is sold make attractive humidors for cigarettes. Rubber washer under lid prevents tobacco from drying out.

Oil Burner Easily Adjusted

BY SUBSTITUTING a transparent, heat-proof Pyrex dish for the metal lid of a coal or wood stove in which an oil burner has been installed, adjusting flame becomes simple. Operation of burner can be viewed through the dish, as indicated in drawing below.

Slow-Setting Plaster

AMATEUR craftsmen sometimes find it difficult to work with Plaster of Paris because it sets so quickly. If powdered Borax is mixed with the plaster in a one-to-eight proportion, the plaster will take almost twice as long to set. Mix powders well before adding water.

Finished desk set holds pencils, pens, stamps, paper clips and other writing accessories. Details below.

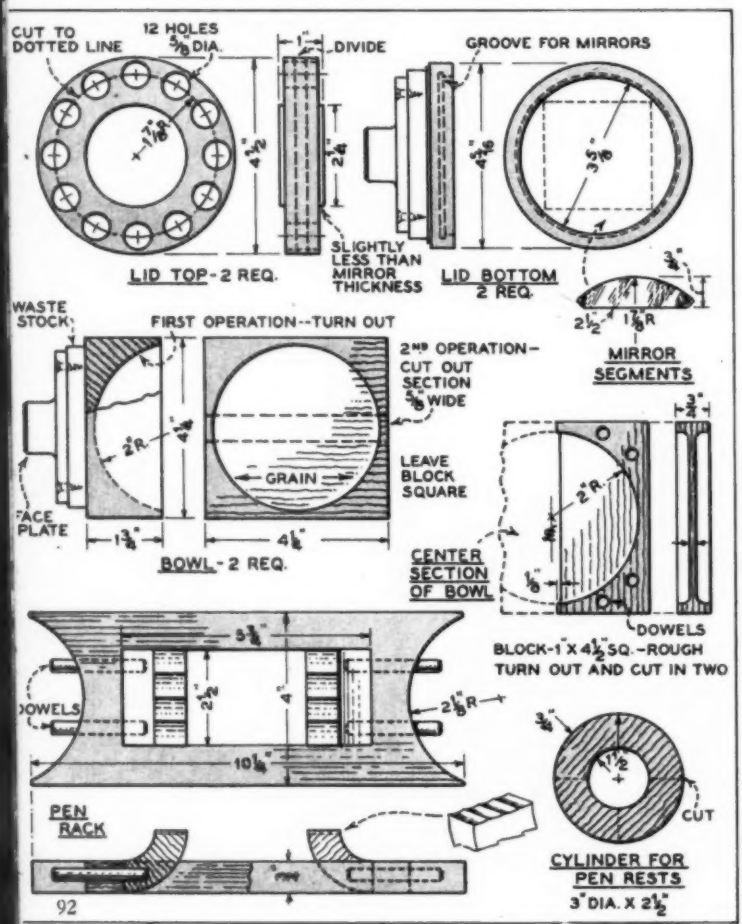
Turned Desk Set

Two evenings' work on your wood turning lathe should be ample to make this set. Walnut or maple is recommended.

SPARKLING mirror glass inserts add a highly decorative note to this attractive turned desk set. The construction, while simple enough, is rather tricky and produces some unusual and very interesting results—the divided bowls, the mirror inserts and pencil and pen rack.

Construction begins with the bowls. These are turned from blocks 1¾" thick and 4¼" square. Each square block is glued to a piece of waste stock and mounted on the faceplate of the lathe, then the inside of the bowl is turned out and carefully sanded. A cardboard template is used to facilitate turning out a truly circular bowl. The outside of the block is not turned off at this time. The block is taken off the faceplate and a center section is sawed out, as shown in the drawing. Next, a 4½" square of 1" stock is turned as indicated. Sections cut from this turning become the dividers in the bowls. Then the split bowl block and one of these dividers are doweled and glued together, care being taken to fit them perfectly.

When the glue has dried thoroughly, the assembled block is mounted on the faceplate of the lathe by means of waste stock and the outside is turned off to finished size and sanded thoroughly. Then the face of the bowl is trued. If the tool is available it



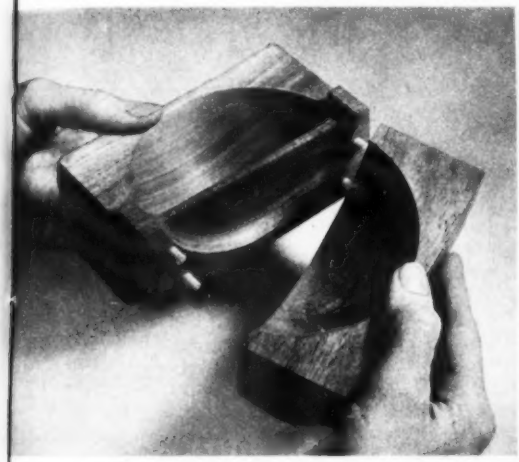
is advisable to bandsaw to circular shape and then sand.

The second bowl is made in exactly the same manner as the completed one.

The base is a piece of ¾" material shaped as in drawings. Ends are bandsawed to fit the bowls and the center section is removed. The pen and pencil rack is formed by cutting sections from a turned cylinder. Troughs for pens and pencils are bandsawed and sanded with drum sander.

Bowls and pencil rack are now doweled together. Then the whole assembly is carefully sanded. Synthetic shellac or clear lacquer well rubbed down makes a satiny finish. Study of drawings and photos will show the details of construction in the making of the lids.—*Benjamin Nielson.*

Lid is assembled as above, with mirror insert under top. Mirror is in four sections to minimize breakage.



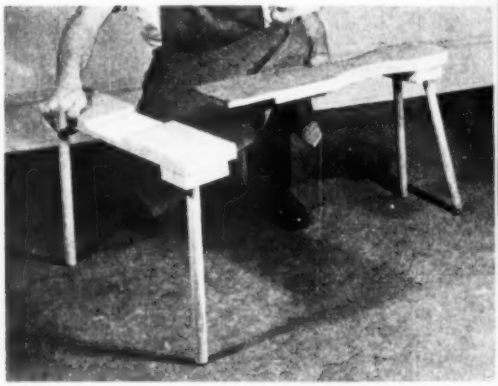
Bowl is doweled and glued together in three parts. Below: Completed bowl being turned to smooth finish.

Pen rack is also attached to base with dowels. No nails or screws are used. Below: Turning off face of lid.

Boy's Workbench with built-in Stool

An evening or two of work and a few scraps of lumber will produce this useful workbench for your youngster, or yourself.

by Charles
and Bertram Brownold



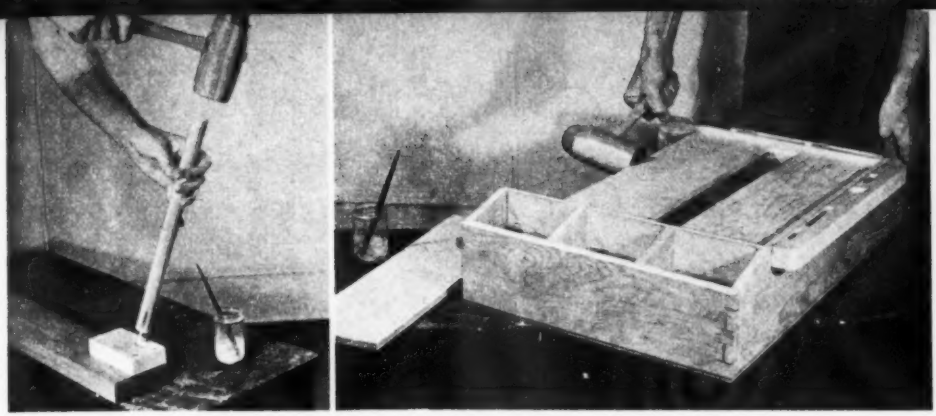
T-shaped members of bench are joined by a half-lap joint, as above. At right, Junior can have fun by the hour with this outfit.

IF YOU decide to make the combination workbench and stool shown in the accompanying illustrations, better be prepared to make two of them. For if you make one for Junior you will find that it is such a handy contrivance that you will probably want one on a larger scale for yourself.

It embodies numerous advantages. Its simple, sturdy construction makes it easy to build and amply rugged for the kind of treatment that active youngsters are bound to give it, or for the hard wear that the adult craftsman will subject it to. Its cost is low by any standard, but particularly low in comparison with retail prices current for similar furniture. About $1.75 will cover the cost of everything needed. It is made of non-critical material so you will lose no time and have no trouble getting what you want.

But best of all, it is light and small enough to be easily portable, so that it may be used outdoors in pleasant weather and indoors at other times. Thus Junior can get the benefit of sunshine and fresh air at the same time

Screws reinforce the glued joint and provide pressure while glue dries. They are left in permanently. Jig for drilling leg holes at accurate angle is shown at right.



Wedge in saw kerf at top end of each leg makes it a tight, driving fit in the socket. Top pieces (right) are slid into frame dadoes.

that he is learning the delights of craftsmanship.

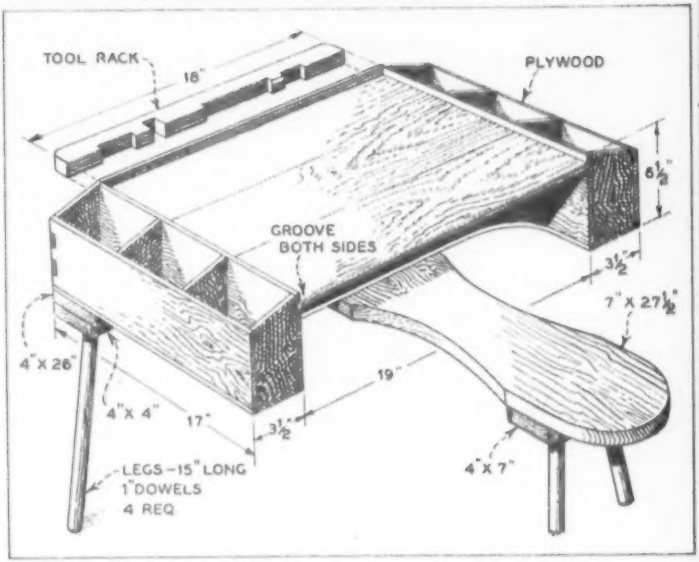
When it is time for Junior to go indoors you can pick up the workbench and stool, the tools, the unfinished work, and the unused material all in one self-contained, compact unit.

The combination workbench and stool is simply a box on a bench.

The Bench is T-shaped, the two members of the T being joined in a half-lap joint. The joint is glued up under pressure applied by coarse screws, and the screws are left in place.

The seat is shaped as shown in the drawing. Lumber of ¾" or ⅞" thickness may be used throughout.

Blocks glued and screwed to the underside of the T provide, when drilled, deep holes for the legs. These are of 1" hardwood dowel, and are glued in. An easy way to drill the holes all at approximately the same angle is to make a scrapwood guide, as shown in one of the photos. Nail the guide temporarily in place and sight on it when using the brace and bit. [*Continued on page* 134]



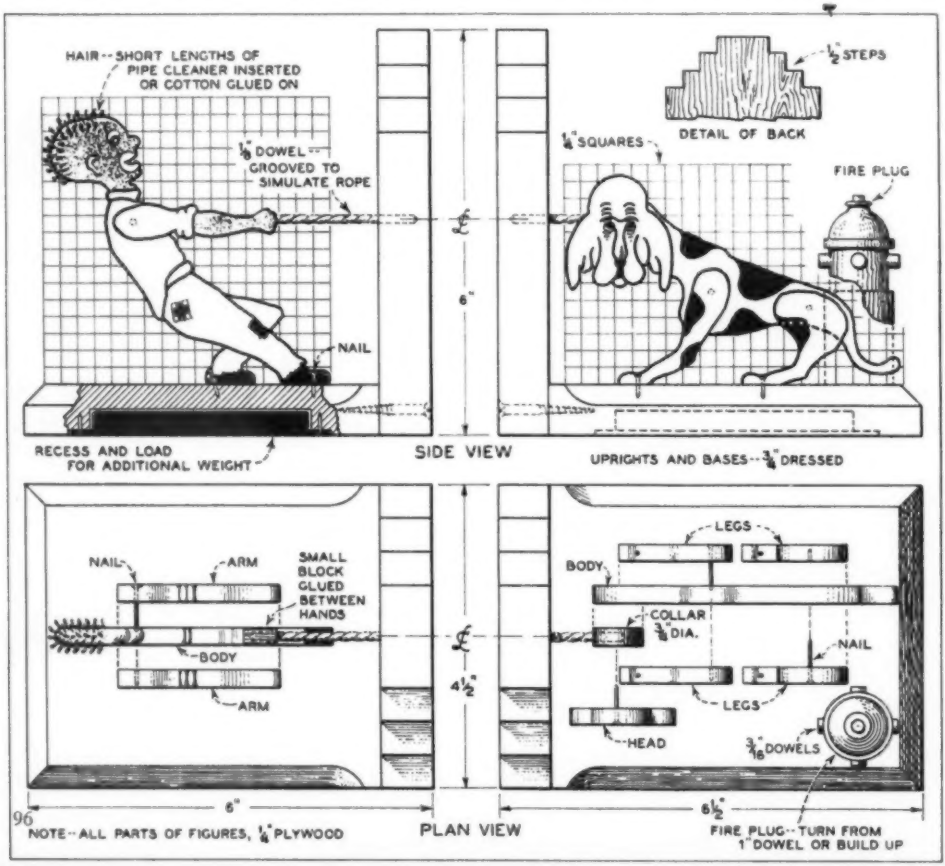
Suggested dimensions are shown above. These can be varied for adult-sized bench. Below: Completed bench-stool unit.

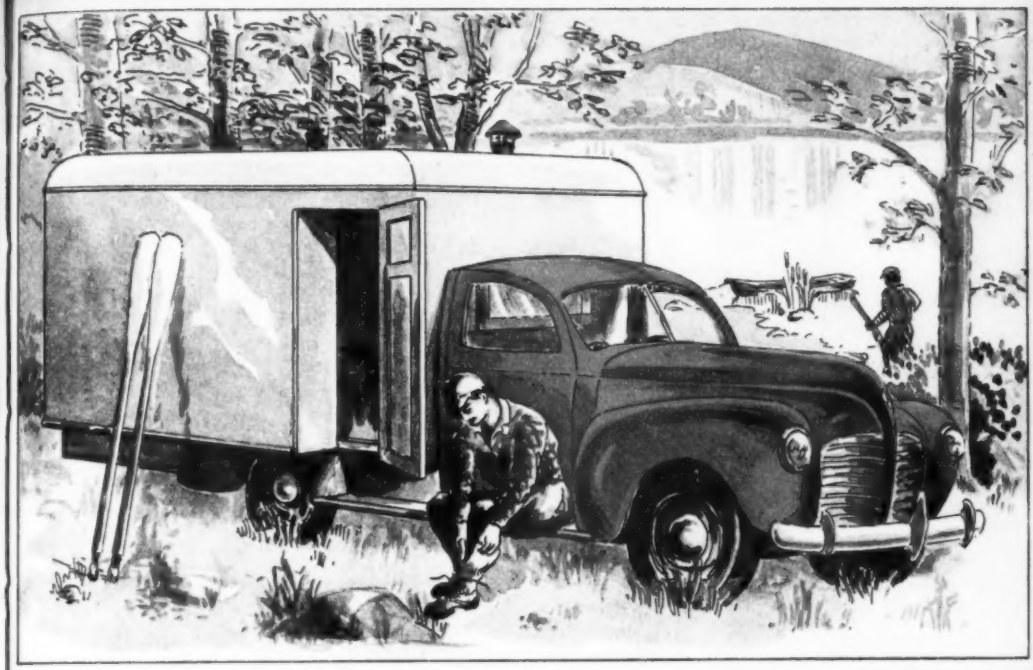
Houn' Dawg Bookends

by John J. Gallivan

THERE is something in the situation pictured by the oversized hound and the diminutive colored boy in this bookend group that brings a smile to most faces. Of simple construction, they may be undertaken with simple hand tools.

The component parts of the boy and dog are cut from ¼" plywood with a scroll saw. Sand edges carefully. Cut the dog's collar from a piece of ¾" dowel in which a ⅛" hole has been drilled to take dowel that represents rope. Collar is ¼" wide. Attach the dog's legs with a fine brad through each after coating with glue. Set dog upon legs and attach collar so that hole is perfectly horizontal. Next take boy's body and set up on feet before attaching arms. The height of the hole in the dog's collar will determine the placing of the arms . . . they must set so that they are centered just opposite to the hole. In other words, the rope must pull on an even line to represent its being taut. The dog's head may be made in one or two pieces, depending on whether or not the craftsman wishes a dimensional effect. Originals have simple head with features sketched on, but nose and jowls [*Continued on page* 134]





Housecar For Postwar Travel

Build one of these for your hunting and fishing trips—now or after the war!

by J. A. Emmett

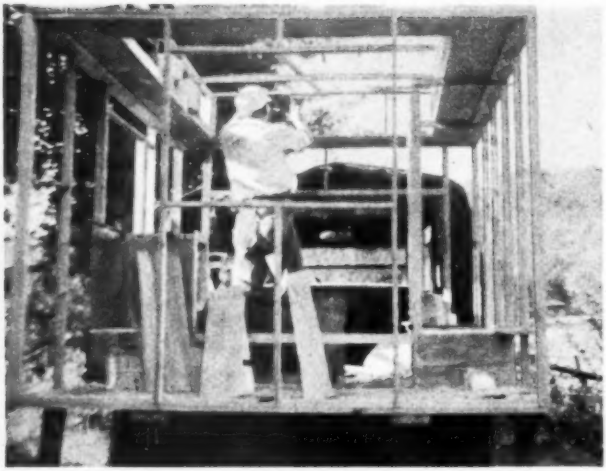
THIS outfit will provide you with low-cost but comfortable living quarters for your postwar vacation travel, or on hunting and fishing trips back into isolated sections; country where really good sport can be had but where, especially in the spring and fall, bad roads prevent use of the usual trailer.

For the chassis of the original Housecar, a Cadillac sedan was bought for very little; a rather antiquated model, but as is often the case with such heavy cars, the engine was in perfect condition. Lincolns, Packards and similar cars are available at reasonable prices, and will be even more so after the war. Bodies are usually made of light steel or an alloy, which permits cutting the entire top through over the forward edge of the back door opening, removing the after section down to the chassis frame, but leaving front intact.

To the two steel chassis frames thus revealed, bolt a pair of 2″x8″ oak timbers the length of the proposed house. Across them fasten a floor of heavy 1⅛″ tongue and groove material. It may be necessary to bring this merely up to the wheel housing, with boxes later built over the housings to form bottoms of the two large side lockers shown in layout plans.

Make the house in four sections, then assemble on the floor. Low priced stock, 2″x2″ pine, may be used for framing—one side with a door opening and one with a window; the back end has a window and the forward end another window at cab height. Windows are framed with top and bottom pieces and uprights in between. Height of sections is kept at 5-ft. which, with the additional height of the rounded roof construction gives a total of 5-ft. 9-in. headroom. Securing full 6-ft. would be merely a matter of carrying the sections 3″ higher, but it is best to keep the house as low as possible.

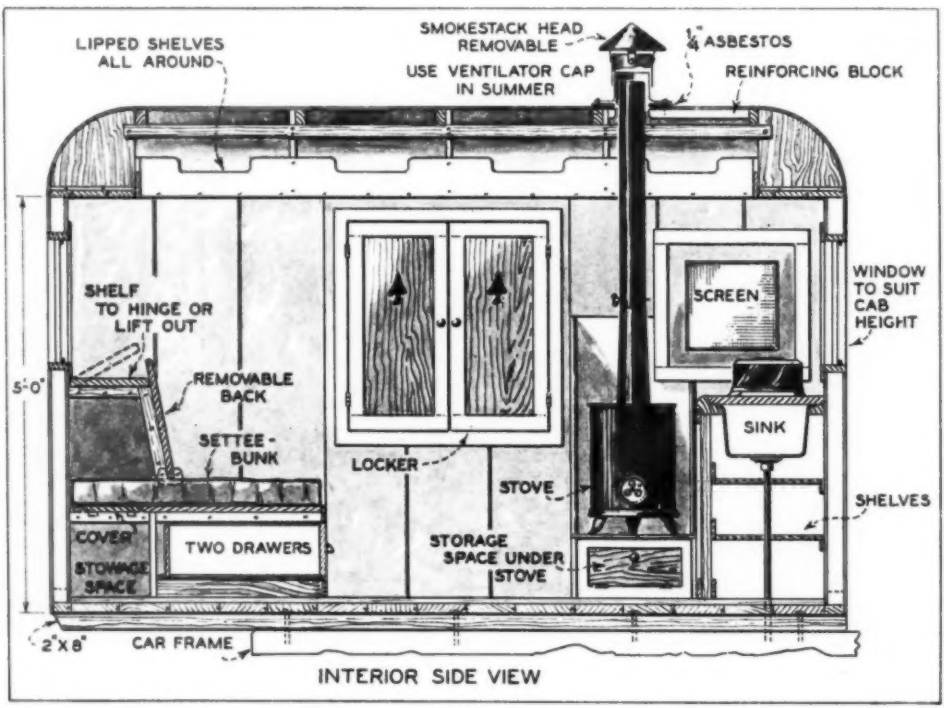
The sections are set up on the house floor and fastened with ¼″ carriage bolts through



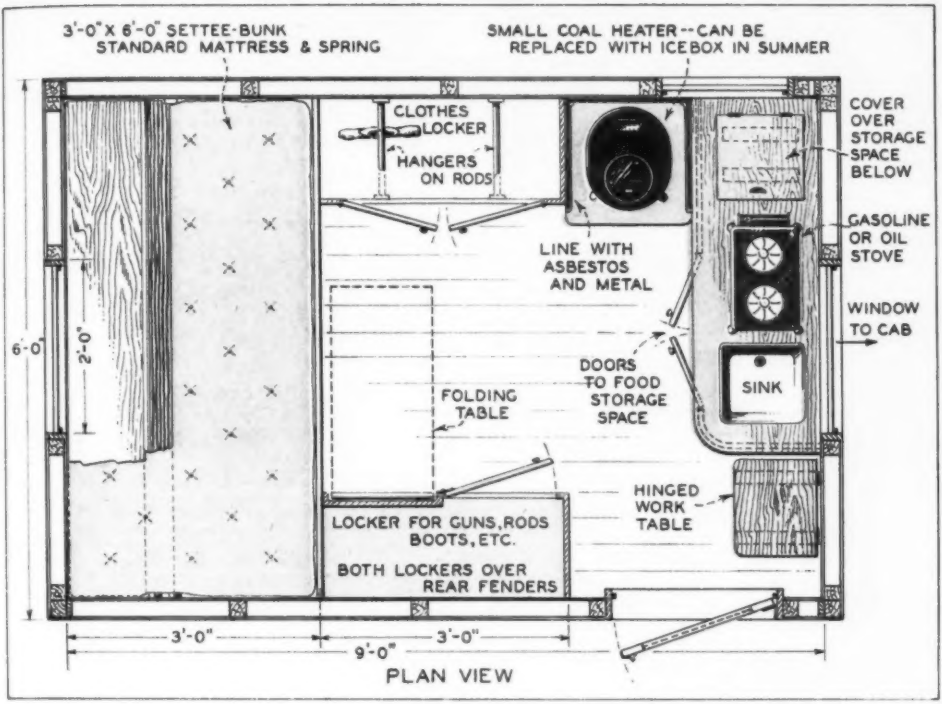
Framework, showing boxes over wheel housings in place. Floor rests on heavy oak timbers fastened to chassis.

the bottom framing; then they are fastened to each other at the corners with similar bolts; be sure the work is square and plumb. As the sides come well outside the wheel housings there is ample room for changing tires. A shelf of 1″x12″ pine is fastened atop these four sections with corners mitred and fastened with 1″x3″ strips over the joints.

The rounded roof construction takes away that appearance of top-heaviness that an ordinary square roof would give; it is easily built and the shelves when fitted with lips give handy stowage space along all sides where headroom is not necessary. Eight quarter circles are sawn out of 1″x12″ stock and set up on the shelf—three to each side, two to each end, screw fastened from beneath. With these in place temporarily tack a few full length strips over the rounded surfaces, ends and sides, to determine the shape of corner sections over the shelves. These will, of course, be fuller than quarter circles. Their shape is best obtained by making a cardboard pattern to suit the run of the slats where they meet at the corners; actual members are fastened atop strips over the shelf joints and held in place for the time being by the temporary slats. A scant 2″ down from the inner top

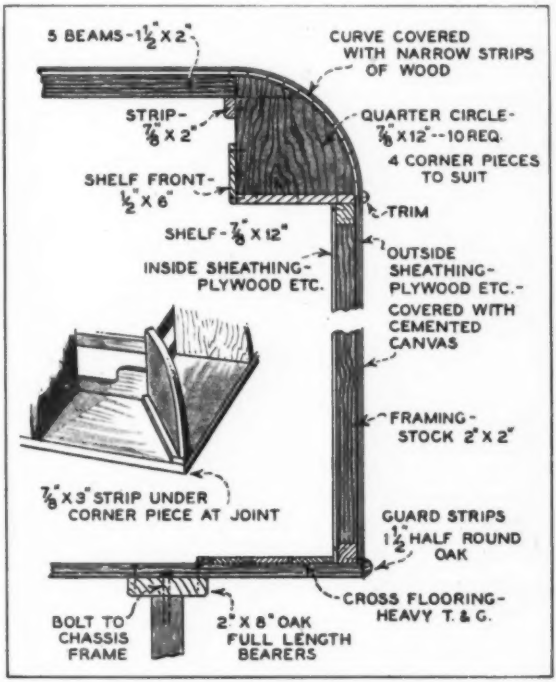


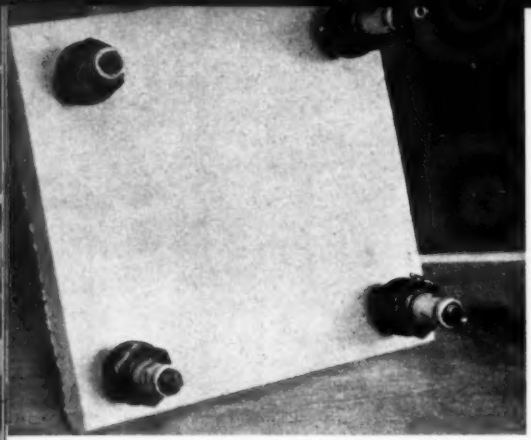
INTERIOR SIDE VIEW



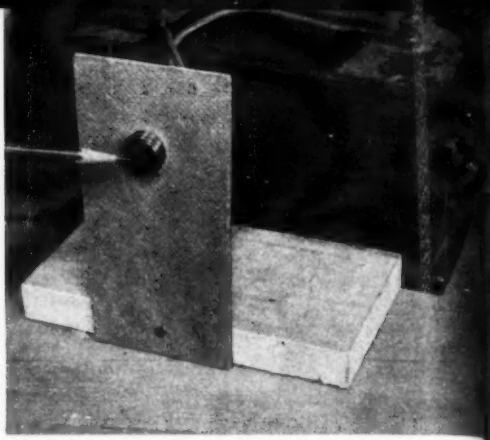
corners of side shelf sections fasten a 1"x2" strip each side to help take roof beams. There should be seven of these in all; one for each pair of quarter circles, and two for the ends. The latter are fastened to faces of the quarter circles, tops level with tops of other beams. This completes an easily-built but strong framework.

There is a wide selection of suitable sheathing materials, with some choice even in these times. Lightness is an important consideration here, as throughout the building. Thin T & G stuff could be used, with any beaded edge for finishing with paint or varnish; or it could be laid flat side out for covering with canvas or leatherette. In either case, sheathing over the roof should be fabric covered with the fabric brought down over rounded edges; these to be covered with narrow 1½" or 2" slats of the same thickness as the rest of the sheathing. Quarter-inch plywood would be ideal, but [*Continued on page* 136]





INSULATING FEET FOR HIGH TENSION APPARATUS: If slightly undersized holes are bored in wood, old spark plugs may be screwed in place. Above they form feet for the base of a low-powered Tesla coil. They are heat insulators for metal-based equipment.

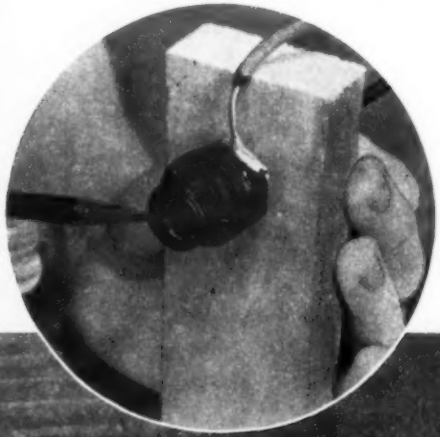


HOT SPARK IGNITOR: Connected to an old spark coil, spark plugs may be used to ignite explosives at a distance. Such coils provide sparks hot enough to set off firecrackers if the fuse is placed directly between the electrodes. Don't try this until after war.

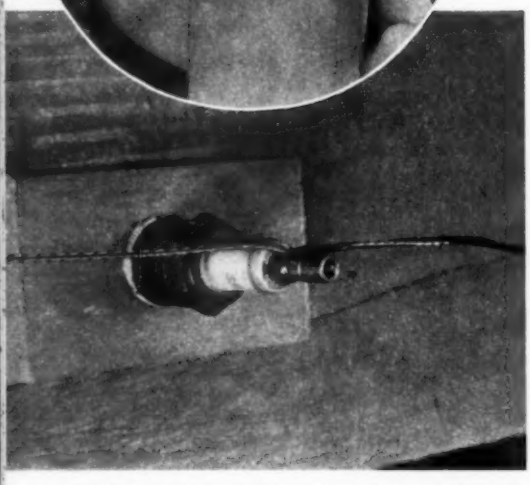
New Uses for

by Raymond Yates

IT HAS been estimated that an average of 60,000,000 spark plugs are discarded in this country alone each year. While most or all

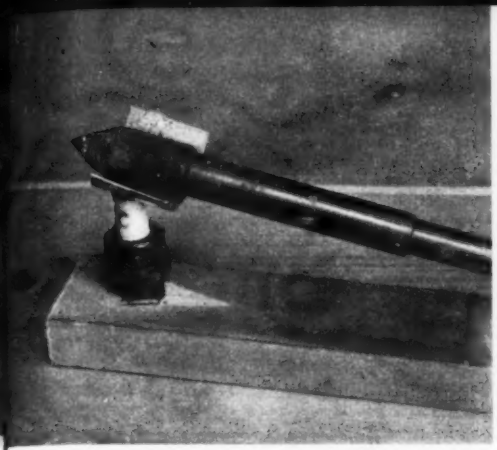


SPARK PLUG FIRE ALARM: If a small bit of fusible metal is placed so as to short plug terminals, a closed-circuit relay may be made to open and ring an electric alarm when excessive heat melts metal.



STAND-OFF INSULATOR: As much as 25,000 volts may be applied to the central electrode of a spark plug without danger of serious leakage. For this reason they make excellent stand-off insulators for radio sets. They also serve as lead-in insulators.

HANDLES FOR HOT OBJECTS: Again we call upon the spark plug for the fine insulating qualities of its porcelain sleeve. Pot covers, percolators whose wood handles have charred, furnace doors, are a few uses. Drill hole in object, attach plug with nut from inside.



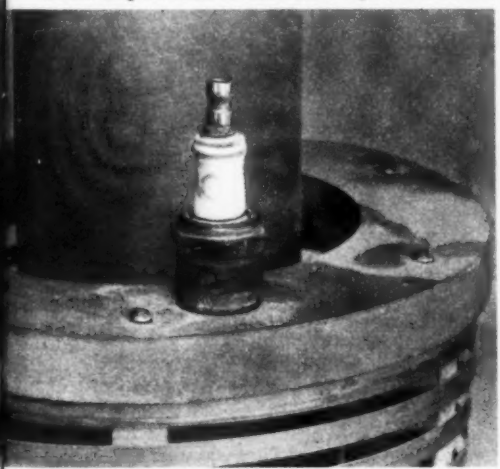
INSULATED SOLDERING IRON HOLDER: Metal soldering iron holders dissipate much of the iron's heat by radiation. This cradle is a piece of drilled brass bolted to the central electrode of an old plug. It is thus insulated from other objects, preserving the heat.

TERMINALS FOR HIGH VOLTAGE TRANSFORMER: Transformers with voltages as high as 20,000 may employ spark plugs for terminals. In such instances, the plugs are first soaked in gasoline to loosen old carbon and are then carefully cleaned with a steel scraper.

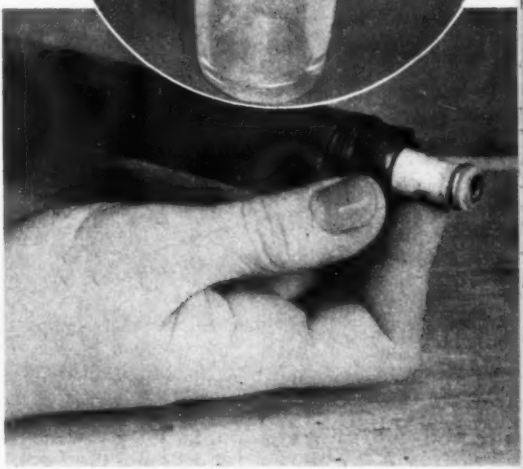
Old Spark Plugs

of these plugs are no longer useful for ignition purpose, there are many ways in which they may be salvaged for further service.

RAIN WARNER: This is strictly a gag. Place table salt and wired plug in glass. Rain falling in glass will form electrolyte through which current will pass. Connect relay and battery in series with plug. This circuit may be used to make bell ring when it rains.



TESLA COIL TERMINAL: Experimenters in electricity who make and use Tesla coils will find that old spark plugs make good insulators for the coil's terminal wires. Small electrode in rim of plug should be removed. Plugs also make good lightning arresters.



FOUNTAIN OR HOSE NOZZLE: If center electrode is removed with pliers, remaining part of plug forms efficient nozzle for garden watering system. Threaded portion is cleaned, tinned and soldered into end of pipe if latter is metal. If rubber, force-fit it in hose.

THE SCHOOL SHOP

Conducted by Gilbert Paust

Lieutenant, Civil Air Patrol, Westchester Squadron

Lesson 20—Airport Traffic Control

THE traffic policeman of the large city who labors to keep impatient drivers happy, and to prevent jams and congestion along the main highways certainly deserves our sympathy. He has a real problem on his hands. But an even greater task will be that of the air traffic cop of the future, under whose control will come all the multitude of civilian aircraft which our postwar world will surely bring.

In a series of lessons on the use of radio in aerial navigation and traffic control, we are going to learn the tremendous advantages of this method over the previous means at the air traffic cop's disposal, and we shall see why radio beam flying and the radio compass will help greatly our trips over the air lanes of tomorrow.

There is a rule of the Civil Air Regulations which states that provision must be made for the safe operation of aircraft not only on the civil airways, but also in the traffic pattern of an airport. It says further that certain phraseologies and procedures should be established so that the pilot of a plane can communicate with the control tower operator and understand clearly his directions for landing and taking off. Three methods are used at the present time for this communication; these are the light signal, flag signal, and the radio.

Light signals are made from the tower by means of a portable, directional flashlight called a "biscuit gun." The operator simply points the light at the plane and pulls the trigger or presses a button to turn it on. It can display a red or a green beam. When a plane is in flight in the airport traffic pattern and desires to land, a green light means "cleared to land," while a red light means "continue circling." At night, a pilot approaching an airport turns on his landing light if he desires to land so that the tower operator can advise him how to proceed. Pilots acknowledge signals from the tower by rocking

All air traffic, including airliners, are under control of the airport tower.

Antenna of Curtiss Seagull is mounted over fuselage.

their wings, or, at night, by a single flash of a landing light.

When a pilot is taxiing at the airport preparatory to taking off, a green light means "continue taxiing" and a red light means "stop". A series of red flashes advise the pilot to return to the hangar line. When he has reached the take-off position, a red light tells him to "wait" and a green light to "go ahead." Moving the ailerons or rudder (flashing the landing light at night) acknowledges the message.

Flag signals can be used instead of light signals or to supplement light signals during the day. These flags are of the two colors; red to correspond to the red light of the "biscuit gun," and white to correspond to the green light. They are operated manually. A blue and white checkered flag displayed from a mast on the tower indicates that the tower is not in operation. Signals should be acknowledged by the pilot in the same manner as light signals.

Now let's take a look at radio communications between plane and tower. First of all, before a pilot can operate an aircraft transmitter, he must hold a Third Class Radiotelephone Operator's permit. This he can obtain by filing an application at the nearest office of the Federal Communications Commission and taking a written exam. This exam is not difficult; it consists of ten short questions taken from a group of sixty which he can get by request from the same office.

When a plane equipped with two-way radio is approaching an airport, its pilot must establish contact with the tower ten minutes before his estimated arrival time. He can locate the tower radio on his receiver from its frequency listing on a navigational chart. This contact must be continued until the plane has parked.

The Control Tower Operator is the air traffic cop; he radio-directs traffic.

Transmitters for light planes are small and compact; on fixed frequency and range from 7.5 to 10 watts power.

Before taking off, this contact must be renewed. After take-off, the pilot should not tune to a different frequency until outside the traffic area.

When identifying himself to the tower, the pilot does not use his own name, but the make and registration number of his plane, using the word "zero" for every cipher. For example, his message might read, *"Boston Tower, this is Stinson two, seven, zero, five, one."* The body of his message includes his location, time, altitude, course and request for information. At the end of his message he says, *"Over"* and waits for a reply. The answer from the tower will give him the traffic, wind direction and velocity, and any other necessary information. Having received the message from the tower, the pilot repeats his plane make and number and says *"Roger"* if that is the end of the communication and *"Wilco"* to signify that he will comply with instructions. If the tower has not understood his message because of reception difficulties, or should he accidentally make an incorrect statement, he says, *"I will repeat"* before repeating the message correctly. Usually the pilot makes a second call as he enters the airport zone, identifying his plane and stating his position and altitude. The tower's answer will give him clearance to land, tell him the local traffic, wind direction and velocity over the airport, runway to use; and other vital information.

Here is a typical sequence:

"Cleveland Tower, this is Aeronca six, two, eight, zero, five. Elyria three thousand, landing at Cleveland. Over."

Cleveland Tower delivers its instructions starting: *"Aeronca six, two, eight, zero, five"* and concludes it with *"Over."* Whereupon the pilot repeats,

"Aeronca six, two, eight, zero, five. Roger. Wilco."

When ready to take off from the airport, he calls the tower and says,

"Cleveland Tower, this is Aeronca six, two, eight, zero, five. Ready to taxi. Departing for New York. Over."

Then the tower will call him and give him instructions for taxiing and take-off, and he answers with his identification and *"Roger, Wilco."*

When a plane is equipped

The "biscuit gun" shines beam of green or red light toward the plane.

Army pilots receive landing and take-off instructions by radio. Throat mike has replaced hand outfit.

with a radio receiver only, it can receive similar instructions and messages from the tower and it acknowledges them with visual signals as in the case of lights and flags.

Your next lesson, in Nov. MI will be No. 21—*Flying the Radio Beam,* the first lesson on Radio Navigation. In it we shall learn how to use the airway radio facilities.

Preserving Gun Barrels

WHETHER the sportsman is using modern ammunition, or the old-fashioned sort with corrosive primers; and whether he is using lead or metal jacketed bullets, this simple mixture, easily and inexpensively compounded at your corner drugstore, will prove very effective. For practical purposes, it is only necessary to coat the bore after shooting, and forget it.

Ammoniated Mercury Ointment, 10%, USP ..... 8 oz.
Calcium phosphate, powd. ..... 2 oz.
Green soap, paste ..... 2 oz.
Rig* (or Cosmoline, or heavy vaseline) ..... 2 oz.

Triturate very thoroughly in mortar to make a smooth paste, pack on glass or porcelain jar.

—*RIG is the trade name of a Rust Inhibiting Grease manufactured by Rust Inhibiting Products, 5830 Stoney Island Avenue, Chicago, Ill.

Barrel cleaning, in its usually understood sense, is unnecessary; after shooting any shotgun, pistol, smallbore or high power rifle, it is only necessary to swab a light coating of this compound over the entire bore and chamber . . . then wipe it out thoroughly before shooting again.

Heavily leaded bores (which sometimes occur in .22's) are readily cleaned by a thorough later swabbing with the same compound . . . the calcium phosphate cuts lead away, but breaks down on the barrel steel . . . moreover, the mercury content tends to loosen any leading by amalgamation.

Similarly, the ammonia content has a loosening effect on any copper or cupronickel fouling which may be present from high power rifle ammunition, and after loosening, the calcium phosphate helps to rub it out on later swabbing.

Finally, the moisture content in the green soap is more than sufficient to dissolve whatever potassium chloride may accrue from old-fashioned primer compounds, and render them harmless, while the existing moisture itself is rendered harmless by the presence of the Rig or other grease.

I have been regularly using such a compound for all firearms since 1921, and have never had a barrel go bad—either in smallbore, with lead bullets, or in high power rifles with metal jackets of various alloys. It is, of course, essential that every bit of this compound (which I have called *"Barrel-Brite"*) be pushed out with a tight fitting flannel patch before shooting the arm again; *and,* if lead or metallic fouling has previously existed swab with wire brush.—*Clyde Baker.*

IDEAS FOR SERVICE MEN

AN OLD MI CONTRIBUTOR whose name may be familiar to some of you who read this magazine before the war sends us an idea from somewhere overseas. He's PFC Andrew Vena, and he V-mails us as follows: "Pockets, especially in soldier's field jackets, often have an annoying habit of turning themselves inside out when, for instance, a handkerchief or pair of gloves is removed from them. The result is that the remainder of the contents

(coins, keys, etc.) are spilled out and possibly lost. I've discovered a solution of this minor but irritating problem. It's simply to pin or stitch the bottom of the offending pocket to the inside of the garment. This will keep the pocket in its place and at the same time facilitate removal of things from within."

NAVIGATORS OR DRAUGHTSMEN finding themselves for any reason minus their trusty compass can improvise a satisfactory one in a few moments, according to Sgt. P. J. Pecora, Langley Feld, Va., who sends in the next idea.

"Needing a compass for scribing circles, and having none on hand, I made one in a jiffy with two pieces of copper tubing, 4-inches long by ¼-inch diameter. A third piece of tubing 1½-inches long formed the handle. The ends are hammered flat, holes drilled in them, and the three pieces connected by a rivet, as shown in the illustration. Pencils inserted in the open ends complete the compass."

PFC LAVERNE BORNT, Fresno, Calif., has a suggestion for making a practical toilet article kit that is just as serviceable as many of the expensive "boughten" kits. Laverne obtained a cigar box at the PX, and a few thumbtacks from the orderly room. A GI shoelace completed the material list. The shoelace was thumbtacked to the box lid in loops, to hold razor, toothbrush and comb. Razor blade packet, with top end open, is also attached to lid, cemented in place. The box proper holds tooth paste, shaving cream, soap and miscellaneous articles. If you want to be real fancy, you can attach another length of shoelace between bottom and lid with thumbtacks to prevent the lid from falling back all the way when opened.

HERE'S ONE FROM Paul Sorenson, San Mateo, Calif., (these West Coast boys seem to be on the ball this month) and we think you'll admit

it's mighty white of him. (OK, we're just tired.) Paul says:

"A few months ago the use of Cutex pencils by sailors to make white stripes *white* was mentioned. It would be difficult, however, to make a white hat presentable by this means. If the hat isn't too dirty, the job can be done with a homemade cloth bag filled with flour. Just rub the bag over the hat, but be careful not to get it on your dress blues!"

Or put the hat on, and let somebody "Halloween" you with a stocking full of flour.

YOU MAY RUN OUT OF SOAP any day now and not be able to get any more, but don't let it worry you a bit. You can use the no-longer occupied plastic soap box for an admirable combination cigarette and match case. This idea comes from our old friend Sgt. Wilford Vasher, who is still having trouble keeping things dry out there in the steaming South Pacific jungles. The Sergeant converted the soap box by the simple expedient of stripping the striking panel from an ordinary wooden matchbox and pasting it on the top cover of

the soap dish. The interior of the dish, or box, was exactly the right size to hold a pack of Camels, Luckies, or his favorite brand, plus an ample supply of matches. Sgt. Vasher calls his innovation, picturesquely, the "Ever-Dri Cigarette Case."

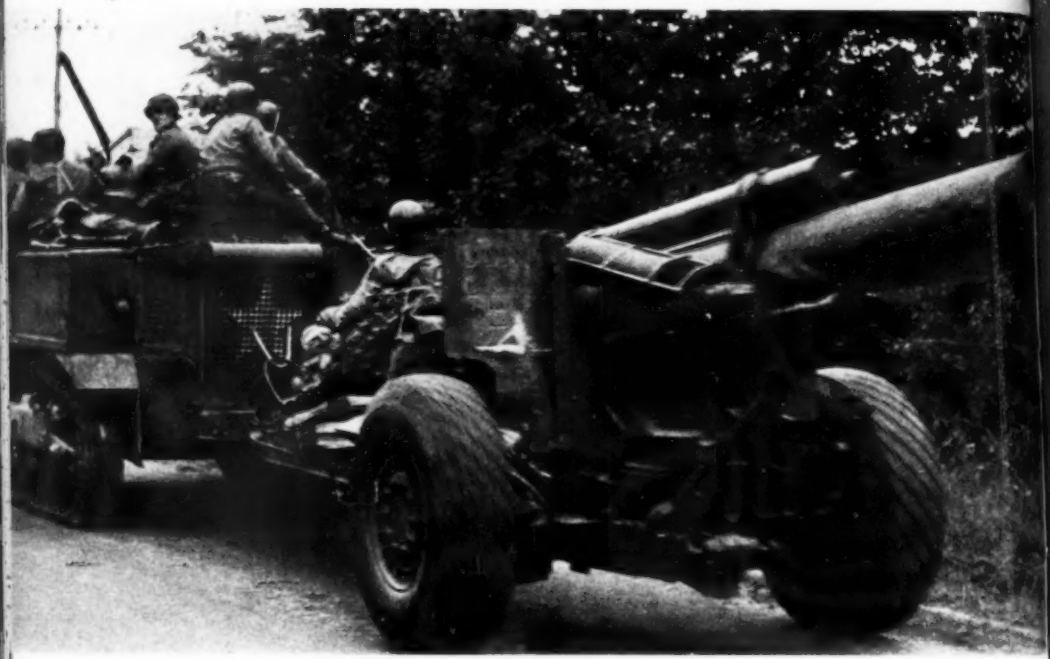
"KICK THE GOLDBRICK! Those tiresome 'full field pack' marches, oh, how I dread them! After many experiences and experiments I found one way to avoid sore shoulders. Try this, fellow gold-brickers. Instead of rolling that old heavy blanket, tent pole, etc., roll your mosquito bar in your shelter half. It makes a nice roll and you'll notice the difference. [*Continued on page* 136]

SERVICE MEN, ATTENTION!

This is your department, and if you like it enough to want to make it better, you can. It's all up to you! Send in your ideas—anything you think may help your buddies in the Army, Navy or Marines. You'll be helping yourself too, because MECHANIX ILLUSTRATED pays from $2.50 up for material used. Address "Ideas for Service Men," MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, N. Y.

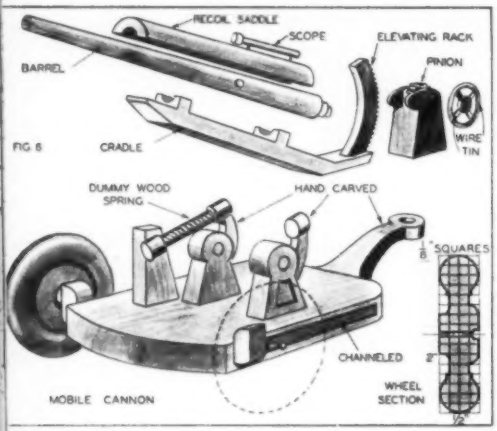
Artillery Tractor and Cannon

Realistic wooden model of one of the Army's most widely employed mechanized units, both in Europe and the South Pacific.



Towing a field piece or howitzer, the tractor can quickly bring heavy artillery to bear on the enemy.

by Hi Sibley



Assembly of cannon model. This is not patterned after any particular model—rather it is composite of several.

THIS broad and powerful tractor, here shown towing a mobile cannon, is applied to many military uses. All of the construction of the model, with exception of minor items of wire, is of wood and easily built by the novice. Several views of both units are shown in Fig. 1, which also gives all the necessary dimensions for the work.

Assembly details are given in detail in Fig. 2. First make the solid block chassis of white pine, which is easy to work, and mount on this the floor platform of ¼" material. Note that this is cut away above the tracks on each side to give clearance, and the floors in the personnel compartments are separate pieces. A solid block is glued in the center of the floor, with other blocks on the sides at the rear, and thin panels installed on the top as shown. These are scored with a blunt tool. Sides and front end of the personnel compart-

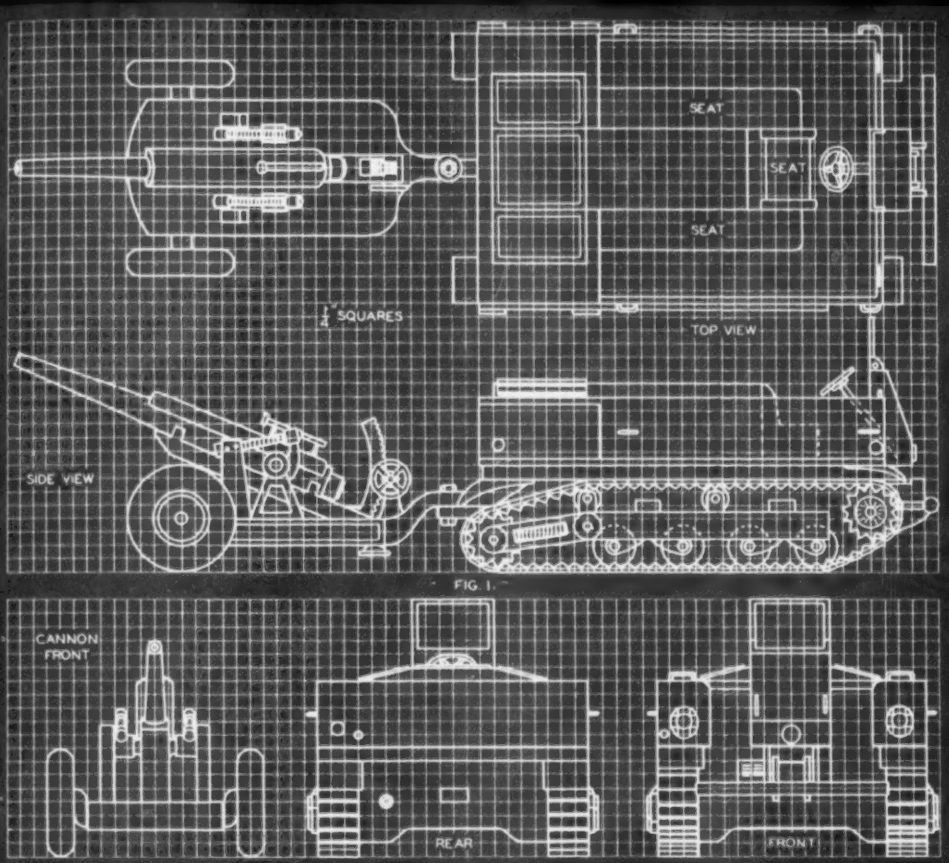


FIG. 1.

Lay out tractor and cannon actual size, in squares, to obtain accurate patterns for cutting out of parts.

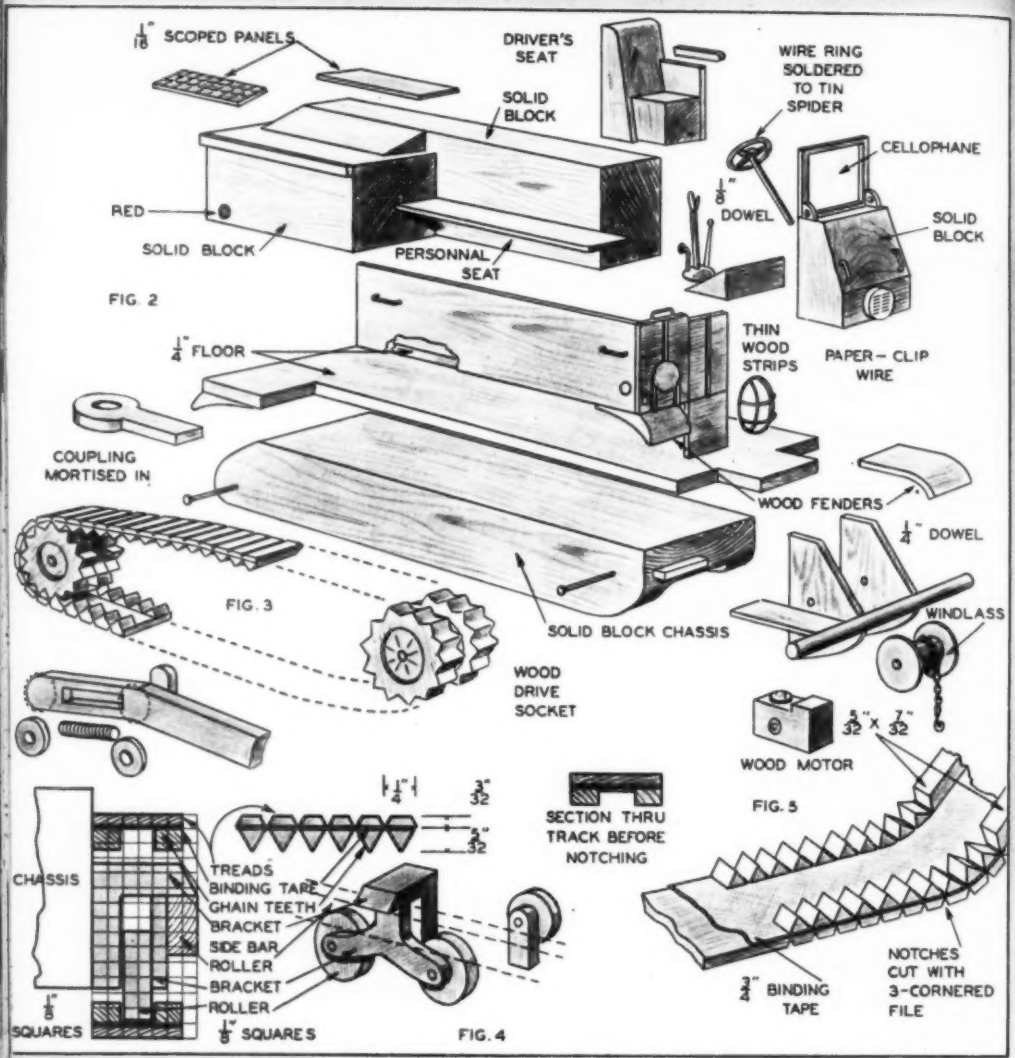
ments located on the sides are of ⅛" material. The front has thin strips of wood glued on to resemble ribs, headlamps of thin wood disks with tinfoil cemented on and a wire guard made from paper clips. Hand grips are also of this material. Red lights are set in as shown, either simply painted on, or ruby beads.

A conspicuous feature is the high, narrow windshield. Make a frame of ⅛" x ⅛" wood and cement cellophane or celluloid on the rear side. This is mounted on the dashboard unit, a solid block cut as illustrated. Hand levers are made of wire and sheet metal, with small balls for grips, and mounted in a button mold.

The brackets supporting the bumper are pieces of ⅛" material, and a windlass is installed between them, with a ten-cent watch chain wound on it. On a shelf at the side is mounted a wooden facsimile of a motor. This shelf rests on a cleat secured to the chassis. Fenders are scroll-sawed from wood and installed as shown. Note that the forward fenders are higher than those in the rear. A coupling is mortised into the rear end of the chassis.

Drive sprockets are first lathe-turned in the form of spools and the notches cut with a three-cornered file. A sectional view of assembly of track, side bar, rollers and brackets is given in Fig. 4. None of the parts move, but are fixed solidly to the chassis. First install the two brackets that are to support the side bar. Glue the roller brackets, with rollers on, to the inside of the side bar and glue the whole to the brackets. There is a drop in the bracket at the rear end with a slot cut to receive a dummy wooden spring, simply a series of notches cut on a dowel, and need not be spiralled. Balsa washers are glued over, where indicated, at each end of the spring slot.

Making the track is comparatively simple. A channeled strip is glued to one side of a



Perspective "exploded" drawing shows how parts fit together.

length of binding tape and a flat strip on the other, Fig. 5. Then deep notches are filed in each side, down to the cloth, or nearly to it. This makes it possible to bend it around the drive sprockets. It will be a good plan to file notches in the sprockets after marking their locations from the teeth of the track, bent around to the same diameter. Ends of the track are glued together on the underside of the rear sprocket.

Not being made to scale from an existing prototype, the construction of the cannon permits considerable leeway. Assembly details are given in Fig. 6. Wheels are mounted on a wooden platform with channeled sides and gun supports installed as shown. The barrel itself rests in a cradle having a wooden elevating rack at the rear end, and a wooden pinion and wheel mounted as shown. On top of the barrel is a recoil saddle and 'scope sight of wood. The tow bar and bracket supporting the dummy springs are hand carved with a jackknife.

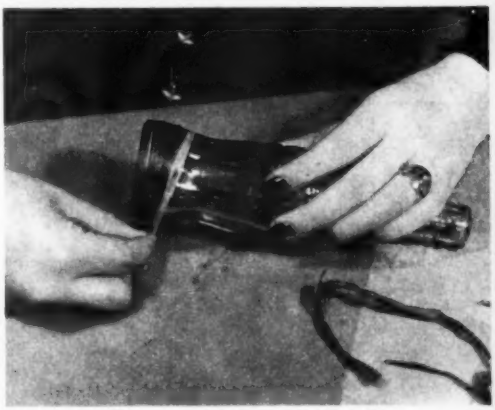
Both gun and tractor should be painted olive drab all over with exception, of course, of the headlights and ruby lights.

RAFFIA CRAFT

Raffia can be used for weaving many durable and artistic objects. The making of a bottle cover and coaster are explained in these photographs and captions. Materials are simple and the job easy. Try it!

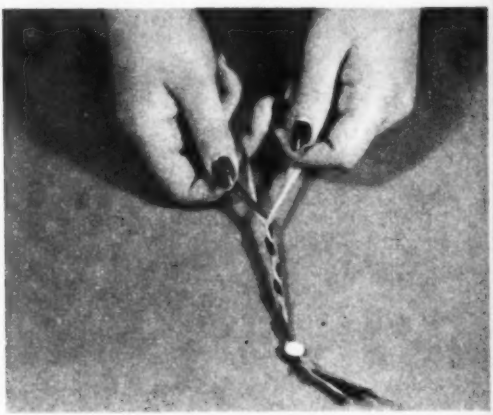
MATERIALS NEEDED FOR BOTTLE COVER: 12 strands dark and 25 strands of light raffia. Bottle, paper cement, scissors, sharp knife, shellac and brush.

After separating strands of raffia and soaking in water, place them on blotter to drain. Then apply cement to bottle and narrow tip of first strand.



Starting with dark-colored strips, wind raffia around bottle. Alternate with light strips every few inches. Cover the new ends with successive windings.

Above: Finish by gluing end strand at top and tucking under last rows. Below: A three-strand braid is attractive finishing touch. Use four light, two dark.



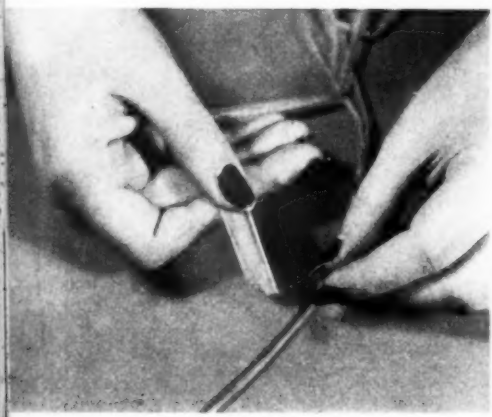
Using thumb tack to hold ends of strands, wind the raffia in a nice, tight braid. The four light strands are divided in pairs, making three strands in all.

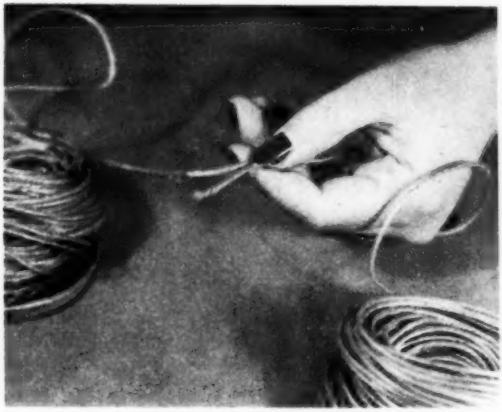
Photos by Camera Clix

Measure circumference of places where braid is to be applied, then cut braid accordingly. Next step is to ring measured parts with cement. Put some on braid, too.

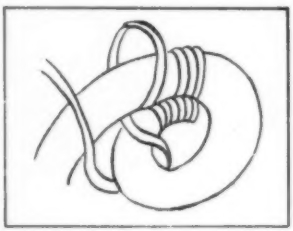
After braid has been cemented on and dried overnight bottle is finished except for shellacking. Brush on at least two coats, allowing 2 hours between.

HOW TO MAKE ATTRACTIVE RAFFIA COASTERS

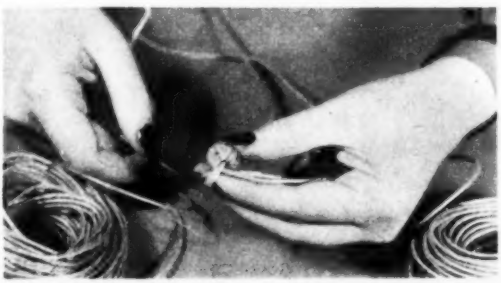


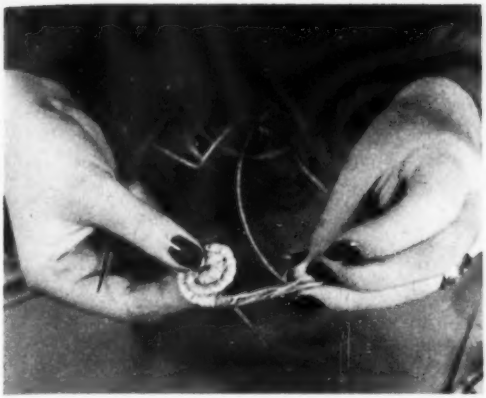


MATERIALS NEEDED FOR COASTER: 25 strands of light and 25 strands of dark raffia, scissors, upholstery needle, sharp knife, ruler, 10 yards twine, shellac and brush. The coasters are started the same way as the bottle cover, with raffia soaked and laid out on blotters. Thread the thick end of a strand through the needle—you'll begin work with the narrow end. Use two balls of twine, 5 yards each. With the knife, cut a neat point on the loose end of each ball of twine.

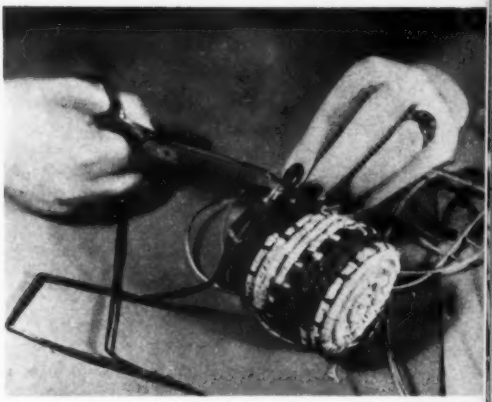


Above: Hold ends of twine together. Below: Make round coil center with light-colored raffia. Begin with knotted strand, with knot tied about 1½" from the end. Thread needle on this strand and wrap raffia over knot to form small center foundation. Insert twine, coil and wrap, then proceed with the Navaho, or figure 8 stitch (left). Base of coaster will begin to take shape.

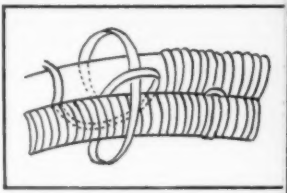


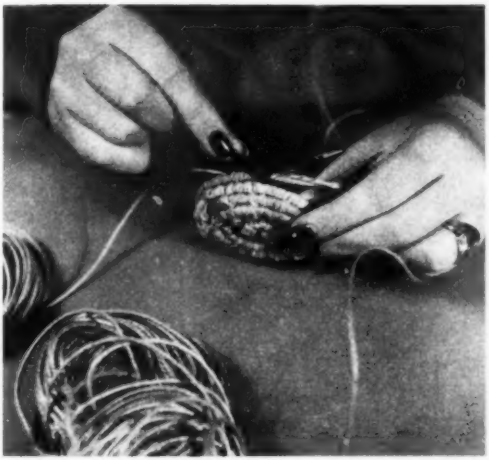


To renew strand, allow ending piece to lie parallel with twine. Place new strand same way, but pointing left. Wrap ends by proceeding with stitching, working toward left. Continue base of coaster until diameter equals glass bottom plus ¼". Start to shape sides by building the rows, vertically, with no flare.

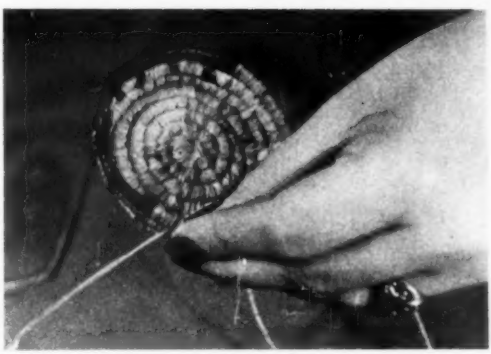


Continue design until coaster is half height of glass. Finish with four loops at top. Before starting first loop, make two Mariposa stitches (right) to hold loop secure. Practice stitch a few times on something else, studying drawing carefully. Note how stitch separates rows slightly, making lacy effect. After finishing loops cut two ends of twine on a slant, about ¾" from loop end. Wrap the ends in raffia, to make continuous finish.





Above: Start design on about third row, using Navaho (Fig. 8) stitch, and dark raffia. Below: Continue with dark color halfway to other side, then change back to light for remainder of circumference. Overlap ends of colors by six stitches; make them of equal length.

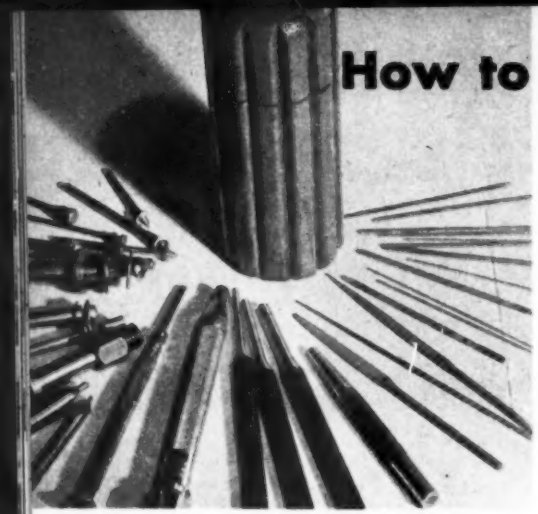


Bring end of raffia to inside of last loop and pull needle through a few previous stitches. This completes coaster except for shellacking. Do this the same as for bottle cover, but shellac inside and out.

How to Make a Plastic Box

Gleaming plastic machined in the lathe emerges as a beautiful, useful article, designed by a famous woman machinist and industrial designer.

by Josephine von Miklos

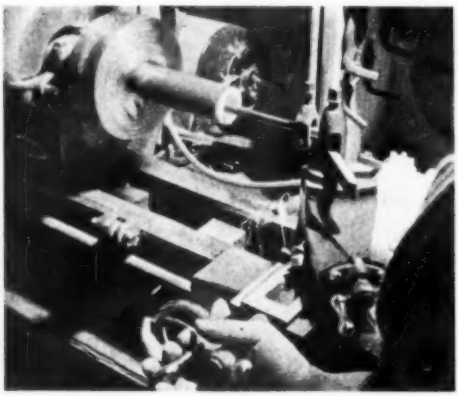


Cylindrical box may be finished with milled flutings, as above, or chased design. It can hold small tools, manicure set, perfume or other things.

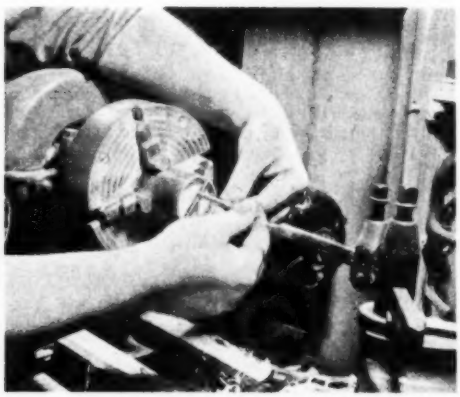
MANY times you may have wanted a special container to hold your very precious Swiss files, or small cutting tools, tiny wrenches, drills . . . any one of those things around a workshop which have a way of disappearing or getting marred, if they are not kept in a very tight place. Or, perhaps you would like to keep your drawing instruments safe, if you are a draftsman. Or your wife has complained that she can never keep her manicure tools together; or she has dropped a hint that some of her precious round perfume bottles have a way of toppling over. Perhaps your young son or daughter can never keep pens and pencils together . . . or any or all of you are the traveling sort of people and find that small accessories have a way of disappearing inside your bag. Whatever the destined use, or uses, the kind of a plastic box we are showing this time, will come in extremely handy . . . and is a great deal of fun to make. It may take a couple of evenings to get it done . . . but then you'll have it.

If you are the kind of a guy or gal who likes things in series, you could easily set up everything in such a way that it would not be a great deal more trouble to make six or a dozen of these things than to make one. If you want it this way, all you have to do is to lay out your, let us say, six pieces of rod, cut pretty accurately to the same size and go through every operation on each piece, rather than finishing each piece separately. Your independent chuck, at first, is set for the diameter of the rough piece.

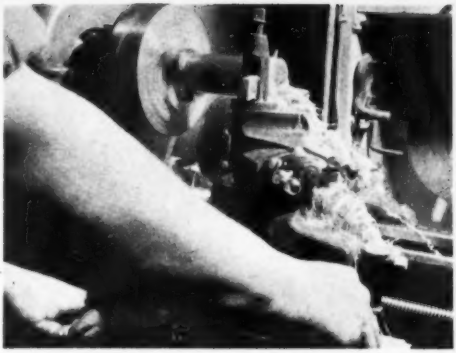
All you do to change, is to loosen two of the adjoining jaws, insert the next piece and tighten again. Then, for drilling, boring, outside and inside thread cutting, etc., your



A piece of round plastic rod of desired diameter is chucked in lathe and a hole drilled to depth of lower piece. Top is later made in the same way.



As boring proceeds, inside diameter is checked for accuracy with telescoping measuring gauge. The piece in this picture is the box's lid.

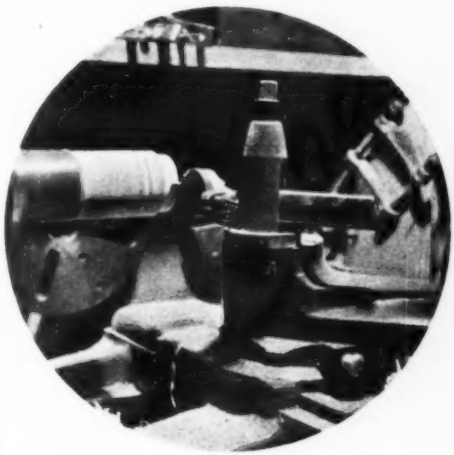


Correct outside diameter is next cut, with cutting tool held in compound rest. Run lathe at low speed.

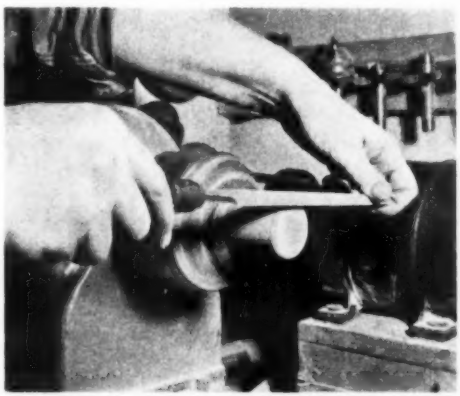
Hacksaw is used to cut work while still in lathe. Top will be threaded inside to screw to bottom.

respective tools are set for the series.

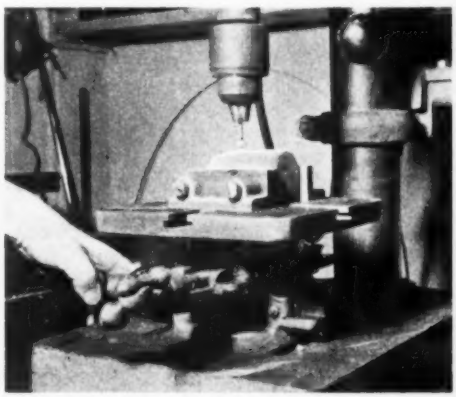
Now, we must remember that there are different kinds of machinable plastics, with some difference to each of them. Basically, there are three types which will be accessible to us; first, and probably most usual, the cast phenolic resin type, such as Catalin or Bakelite cast phenolic resin. Second, acrylics such as Plexiglas and Lucite. Third, acetate such as Lumarith or Tenite. The cast phenolics come in an unlimited range of colors, including translucent and transparent. Acrylics are usually transparent; acetates again come in whatever rainbow shade you may have your heart set on. In machining, cast resins and acrylics are somewhat easier to handle than acetates. They are harder and heat up less quickly; also, they seem to hold a closer tolerance. From the point of view of price, however, acetates are less expensive than the other materials, with the acrylics higher than the others. [*Continued on page* 138]



Rim is turned down on bottom half, then outside threaded to take lid. Lathe still is run slowly.

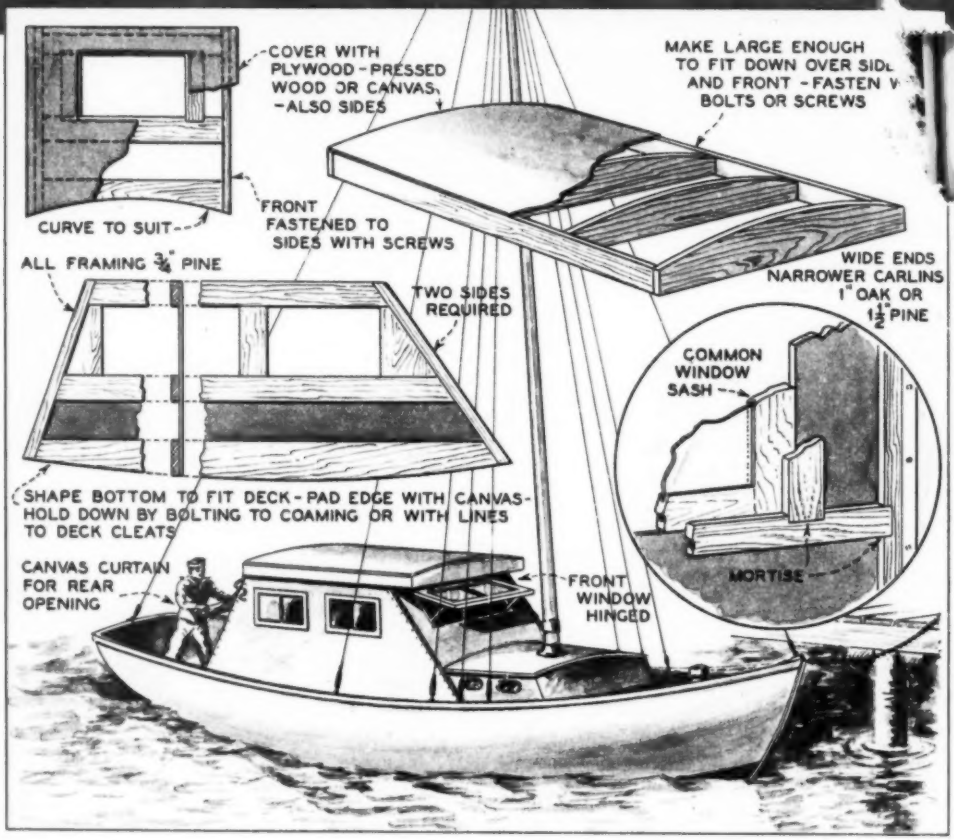


Both pieces are put in the 3-jawed chuck on the wood-turning lathe for rounding top and bottom.



Last step before polishing is to mill flutings in drill press, or cut in desired decorations with Handee tool.

DOGHOUSE for your Boat


COVER WITH PLYWOOD - PRESSED WOOD OR CANVAS, - ALSO SIDES
MAKE LARGE ENOUGH TO FIT DOWN OVER SIDE AND FRONT - FASTEN W BOLTS OR SCREWS
CURVE TO SUIT
FRONT FASTENED TO SIDES WITH SCREWS
ALL FRAMING ¾" PINE
TWO SIDES REQUIRED
WIDE ENDS NARROWER CARLINS 1" OAK OR 1½" PINE
COMMON WINDOW SASH
SHAPE BOTTOM TO FIT DECK - PAD EDGE WITH CANVAS - HOLD DOWN BY BOLTING TO COAMING OR WITH LINES TO DECK CLEATS
CANVAS CURTAIN FOR REAR OPENING
FRONT WINDOW HINGED
MORTISE

by J. A. Emmett

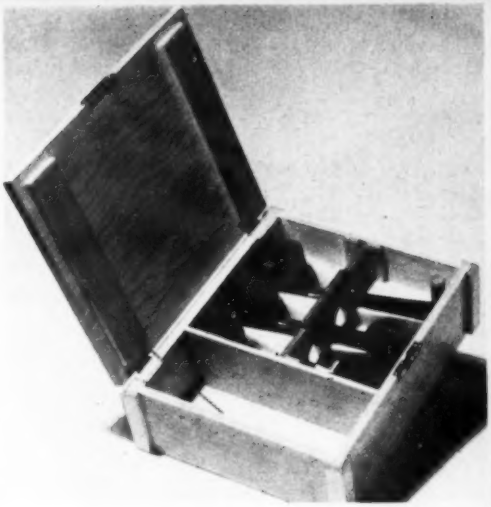
MANY boatowners, especially those with amateur boat building experience who are employed at shipyards engaged in war construction may prefer staying aboard their boats the year around rather than live in unattractive and crowded quarters ashore. The *removable winter Doghouse* or shelter shown above will do much to make such cold weather use of the boat pleasant. It will keep snow and ice out of the cockpit and companionway, make heating of the cabin easier, and provide acceptable extra living or storage room aboard.

The sketches show suggested construction, although the size and shape of the sections will have to be worked out to suit your particular boat. The two side sections should fit down on deck with lower edges shaped to suit, and canvas or burlap tacked over them to prevent marring the deck. They should be high enough to give 6 ft. headroom over the bridge deck or door opening, and long enough to take in the entire cockpit. Use Masonite, marine plywood, tongue and groove, cedar—canvas covered, or other waterproof material for the covering, screw fastening or nailing to the framing that stiffens the sections. Hold the sides in place with a couple of small bolts through the cockpit coamings. If you do not want to mar them with holes, fasten short lanyards outside each side section to make fast to convenient deck cleats or rail scuppers.

Raking the front as shown gives a better-looking shelter. It should be shaped to suit the forward end of the sides and the camber of the cabin top over which it fits. A simple way to fasten it [*Continued on page* 138]

PIPE DREAM

by Maryann Spangler



ATTENTION hobbymakers — you whose hobby is the making of gifts to add to s' hobbies! Are you scratching your d about what to make and give to a friend r a birthday, or perhaps even Christmas? rying to strike upon something that is useful, handy, and has that "homey, gifty" look? Well, for your man who smokes a pipe, here's an answer to his pipe dream—a pipe box!

A pipe box is suitable to grace an end table in a home, or ideal to tuck in the corner of a suitcase to go travelling. The one pictured here weighs only 1½ lbs., so can be carried conveniently.

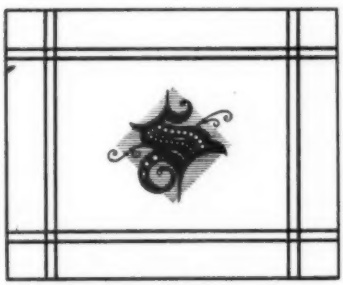
Incidentally, a box of this type—easy to carry around, small weight, and handy to keep pipes in one place—might prove just the thing for you to send your service man, too, if he has pipes, and if he likes to know where they are when he wants them.

The transformation of this one small piece of white pine from a flat board into the dozens of little frit-frets compacted to make this box is comparatively simple for you to make. Let's assemble our materials first of all.

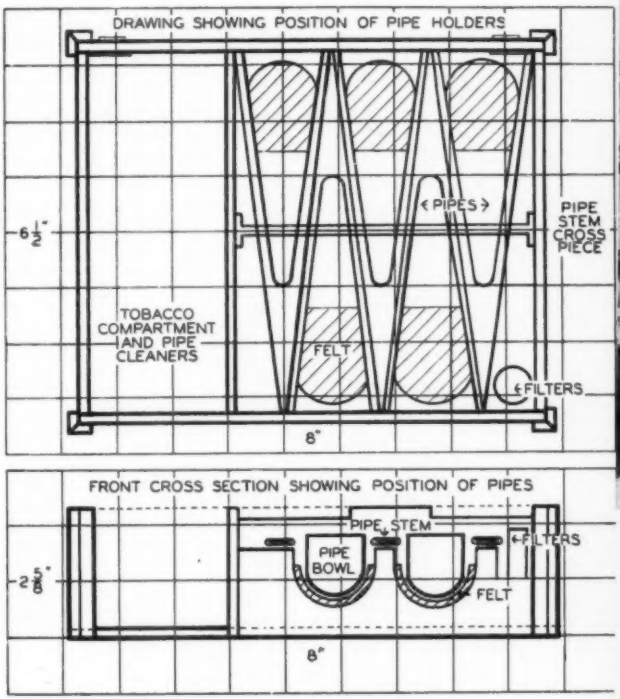
Bottom	1¼"x6½"x8"	1 piece
Sides	⅜"x2⅝"x8⅛"	2 pieces
Ends	⅜"x2⅝"x6½"	2 pieces
Top	⅛"x7½"x9"	1 piece
Underside of top reinforced with 3/16"x1¼"		2 pieces
Cross piece (to hold pipes in place) ⅜"x1⅜"x5½"		1 piece
Pouch divide ⅜"x2¼"x6½"		1 piece
Corners 10/16" squares cut out 7/16", 4 pieces		2⅛"

Cut out one end of bottom 2½", leaving ⅜" bottom to fasten sides and end to. Top is fastened with 2 small brass surface hinges and small brass slide fastener. Brass chain can be fastened with small screw in $\frac{3}{16}$" cross bar in lid and in end piece of pouch section to hold the lid upright when open.

Bottom block of the pipe section, 6½"x5½", is carved out for the bowl of the pipe on the outside ⅞" deep, slanted to top of the block 1" past center. [*Continued on page* 138]

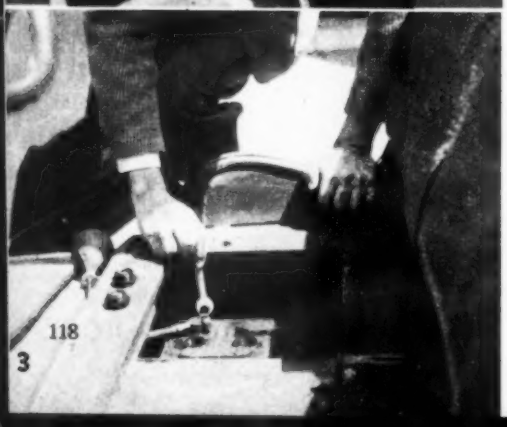


Suggested pattern for lid. Black lines are grooves made with saw.



KEEP IT ROLLING!

by Frederick C. Russell



TRY IT!

IF YOU have ever tested for piston ring leakage by listening to the end of a rubber hose inserted in the oil filler or breather pipe, while someone cranked the engine slowly, you are half way toward a good test for a leaky intake valve. Take off the air cleaner and insert the end of a hose into the carburetor air intake. Now listen while someone cranks the engine. Open the throttle wide, ignition off. If you hear a hissing noise when one of the pistons is on its compression stroke you've caught a leaky intake valve. With a modern engine cranking is done by turning one of the jacked up rear wheels with the car in gear. Remove all spark plugs except the one for the particular cylinder being tested.

* * *

ALWAYS ADD ANTI-FREEZE FIRST when refilling the cooling system for winter, otherwise you may find the system filled up before you have solution up to desired strength (Photo 1). Incidentally, when draining off summer coolant don't forget to open the drains in the motor block as well as at the bottom of the radiator.

IT'S A MYSTERY why we are inclined to check for a fuel system leak while the engine is idle. Why not also when it is operating? Often a leak won't show up until fuel is under pressure from the fuel pump.

YOU CAN TELL a lot about the engine's temperature, even though the heat gauge may have gone haywire, just by watching the oil pressure gauge. It will show a sudden drop if the engine is overheating because the oil will thin out rapidly (Photo 2).

LOSS OF ANTI-FREEZE out the overflow always suggests a sluggish motor thermostat, a clogged radiator or an over-active pump, but don't overlook the effect of what are known as "hot spots" in the block. These are piles of rust and sediment which cause

spotty overheating and steam. Coolant is then forced forward faster than the radiator can take it.

THE SAME RUST which forms these hot spots also eats into the water distribution tube of a modern engine's block. There isn't adequate circulation of water at the exhaust valve seats with the result that steam quickly forms there.

USE OF HEAVY OIL on battery posts (Photo 3) helps to check corrosion but don't forget that this encourages slightly loose connections to slip away. When you attend to the battery take up on the lugs of the connectors.

WORN VALVE STEM GUIDES show up on a vacuum gauge even if the leakage is just the slight kind that upsets idling. When this condition exists the gauge's indicator will show a rapid and fine tremor as the engine is fast idled. It will disappear the instant motor speed is increased.

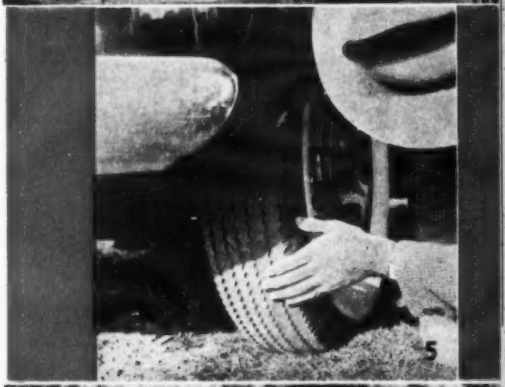
RADIATOR NEED REVERSE FLUSHING? That all depends on how it behaves when water is fed to it with a garden hose. Water should immediately come out the drain if the core is clear. Do this when the engine is cold so that the motor thermostat is closed and your observations are confined to the radiator (Photo 4).

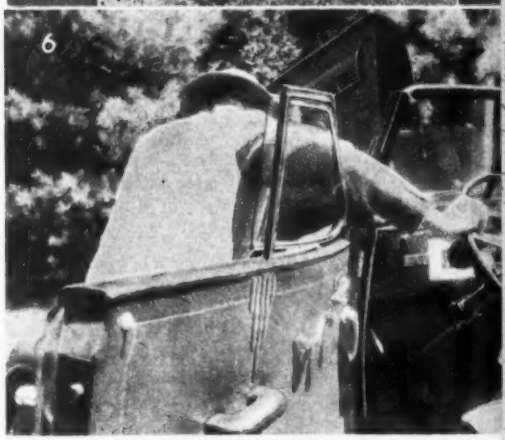
BEST CLUE TO UNDERINFLATION (Photo 5) is wear along the tread edges of the tires while their centers show no signs of wear. I've told J. E. M. that the situation is just the reverse where tires are overinflated.

HARD STEERING, particularly difficulty pulling from the shoulder to the crown of a road, suggests looseness of the steering gear housing. Observe the housing (Photo 6) while turning the steering wheel. If loose, the housing will move up and down just a little.

IF YOUR GAS MILEAGE has been skidding this fall, even though your car has enjoyed the benefit of a heated garage, there's good reason to suspect an excessively lean mixture. It's wrong to reason that if you do not enrich the idling mixture, and increase the acceleration pump's stroke with the coming of colder weather, you can keep mileage up more easily. It works just the opposite. Mixture must be correct for the season, otherwise there will be more choking, more gear shifting and need for a wider throttle to get normal results.

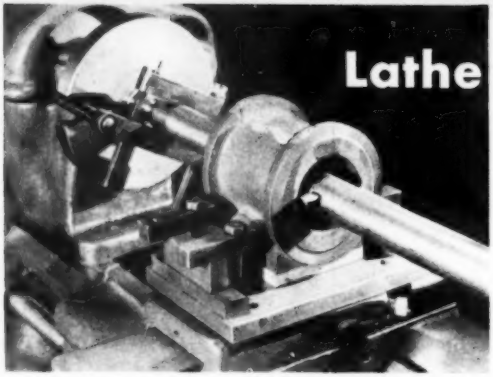
If your car is equipped with an automatic choke it would be a good idea to check this over and adjust the thermostat control.





Your car needs careful attention, particularly during wartime. If you have a problem with your car, ask Mr. Russell. Just send stamped, self-addressed envelope to him at Mechanix Illustrated, 1501 Broadway, New York 18, N. Y.

Lathe Boring Table

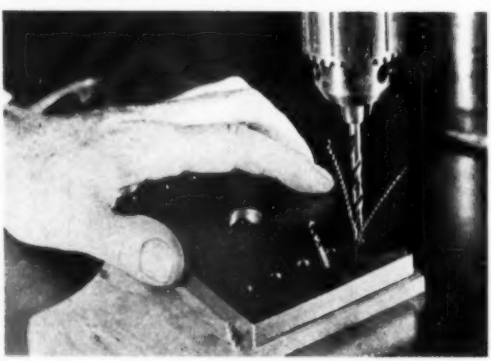


In operation, boring table is mounted on cross slide.

FOR bringing certain types of machine work to completion a simple home made boring table will be a worthwhile addition to the equipment of the small metal cutting lathe. It is an easy made accessory constructed from odds and ends found around 'most any shop. The table is made from a small piece of cold rolled steel plate with a clamping lug made up separately and riveted underneath for mounting on the cross slide of the lathe in place of the regular compound rest. With the work blocked up and shimmed to exact lathe center height, and firmly clamped to the table it can be accurately adjusted laterally by the cross slide feed screw and fed to the cutter of the boring bar by the carriage hand wheel, or under power feed from the lead screw. While no vertical adjustment is provided, by shimming the work to proper height, many jobs can be machined which otherwise might be too cumbersome to mount in the chuck or on the faceplate of the lathe.

With a suitable piece of steel plate on hand for the [*Continued on page* 140]

Clamping lug hole is drilled with table in 4-jaw chuck.



Above: Drilling holes in each end for strap clamp-screws. Below: Turning clamping lug to shape. Use steel or brass.

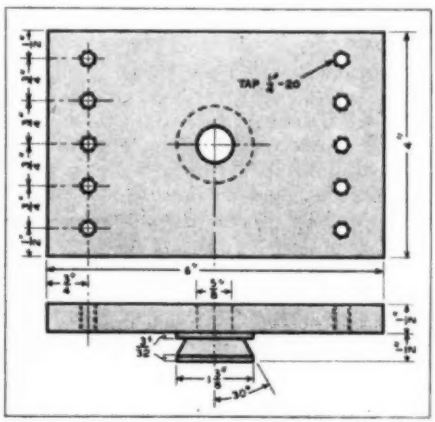
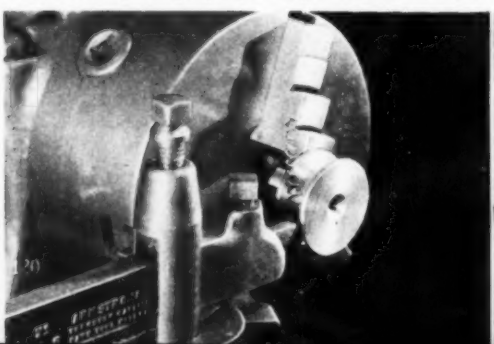
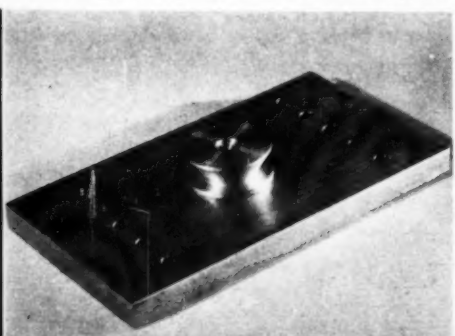


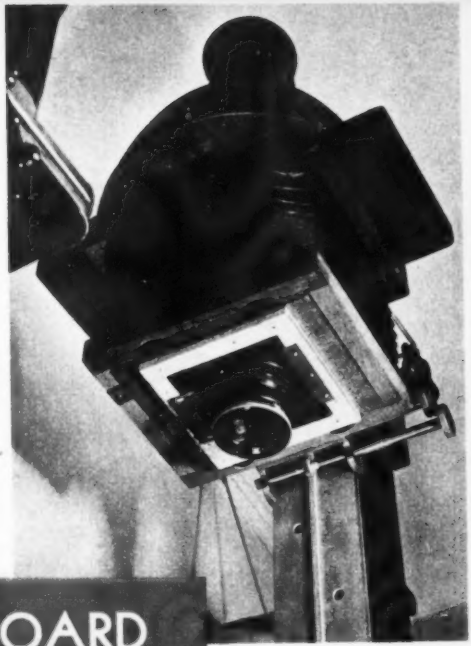
Diagram shows suggested dimensions for boring table. Below is finished table with clamping lug.





Use your camera lenses in the enlarger without the nuisance of changing lens from one board to another.

by Louis Hochman

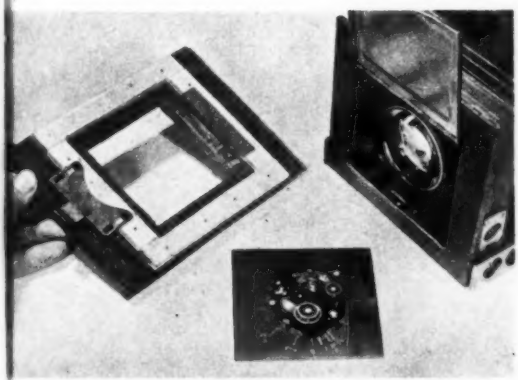


ENLARGER LENS BOARD

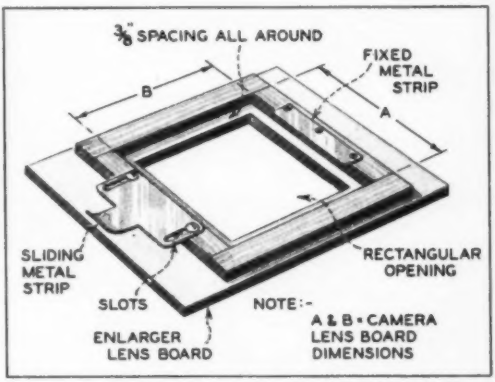
OWNERS of large cameras such as Speed Graphics, Graflexes, Press Cameras, etc., that take interchangeable lens boards, can adapt their enlarger lens boards to take the camera lens mounts, provided that the former are larger than the latter. The outstanding advantage of this is that the single enlarger lens board, which will serve as a master adapter for as many camera lenses as are mounted on camera lens boards, will serve for all the lenses without requiring duplicates fitted with various lens flanges. Thus, whatever lenses you may have for your camera can be instantly fitted into your enlarger without having to unscrew them from their mounts.

To turn your enlarger lens board into a master adapter for camera lens boards, cut a rectangular hole in its center, the dimensions being about ⅜" smaller on all sides than the dimensions of the camera lens boards. Now lay one of your camera lens boards over this hole and nail a frame of wood around it to the enlarger lens board. The camera lens board should fit snugly into this frame, which should reach higher than the thickness of the camera lens board. Next, screw a short strip of sheet brass to one side of this frame, allowing it to overlap into the frame about ¼". Then, opposite this, screw another strip of brass, cut as shown in diagram with the screw holes as slots, and a curved portion to serve as a handle.

To insert the camera lens board into this adapter, pull back the sliding brass strip, slip one end of the camera lens board into the wooden frame and under the overlapping brass strip opposite, then push the remainder of the lens board into place and slide the brass catch over it to hold it in place.



The completed enlarger lens board. This adapter will be found a great convenience and time saver.



Construction details of board. It works something like a contact printing frame. Hardwood is best.

PHOTO CONTEST

FIRST PRIZE ($10.00): Vision of the Future, by Paul Hadley, Philadelphia, Pa.; Made with 5x7 view camera on Superpan Press film. SECOND PRIZE ($5.00): Song Without Words, by Eva Luoma, Hollidays Cove, W. Va.; Speed Graphic, Super XX film. THIRD PRIZE ($4.00): Overseas, by John Makar, Detroit, Mich.; taken with Rolleiflex on Verichrome film. FOURTH PRIZE ($3.00): Peace Feelers, by Louis A. Puggard, Ft. Wayne, Ind.

1st PRIZE →

← **2nd PRIZE** *Vision of the Future.*

Song Without Words.

Overseas. **3rd PRIZE** ↑

4th PRIZE →

Peace Feelers.

Submit contest prints unmounted—no larger than 8x10 inches. With each print list camera, film, lens opening and shutter speed, illumination and developer. Write your NAME and ADDRESS on the back of each print and wrap securely with cardboard or corrugated stiffeners. ENCLOSE POSTAGE for the return of unused prints. Published prints cannot be returned. Address: Photography Editor, MECHANIX ILLUSTRATED, 1501 Broadway, New York 18, New York.

Sailboat and interesting reflection are in photo below, but are spoiled by a bald sky. Clouds from a paint tube and darkening of all but boat and reflection make this a fine picture.

Oil Pigment Prints

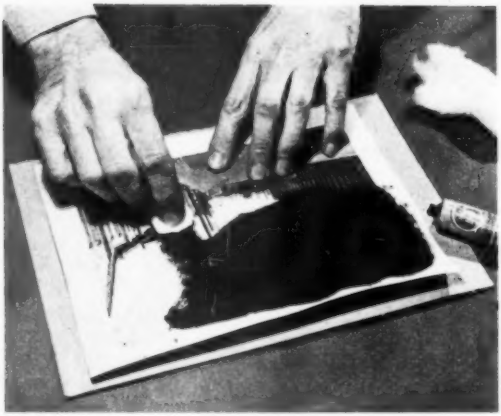
By application of inexpensie oil paint pigment many "hopeless" shots can become beautiful pictures.

by Walter E. Burton

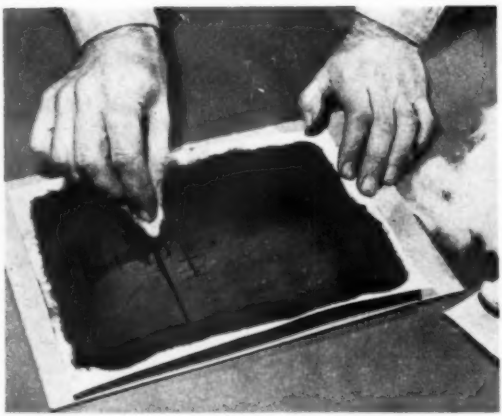
WITH the aid of a tube of oil pigment costing 10 or 15 cents, many a hopeless-looking photograph can be turned into a striking picture that resembles a painting. This oil-pigment process will enable you to produce new pictures from old negatives, thus conserving current film supply. It provides an easy way of putting attractive clouds into a hitherto bald sky. It permits the subduing of certain details and the emphasizing of others, thus allowing considerable control over lighting and composition. And the process may be used to introduce novel texture into a print.

All you need, besides the print, is a quantity of cotton, a tube of oil-mixed pigment of the type sold by paint stores, a pointed pencil eraser, and perhaps some artist's stumps. Usually black pigment is used: any of the various blacks will do. For the accompanying illustrations, BPS Lamp Black was used. Of course, if you wish to alter the tone of the print, you may use brown or some other color.

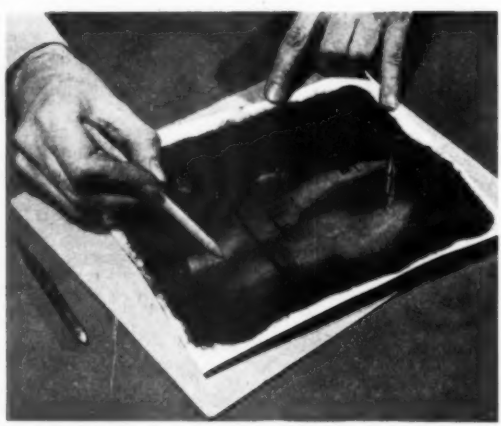
This is a mediocre street scene, with interesting clouds but little else to recommend it for framing.



Spread the oil pigment evenly over our unattractive street scene, making it thick enough to cover well.



With cotton, wipe off pigment from areas to be lightened. Below: Details are brought out with eraser.



The print should be on paper having some surface other than glossy. Usually a light print is better than a very dark one, for the pigment has a darkening action. There should be a margin of at least ½" to permit easy handling. Otherwise, it is desirable to tack the picture to a board while you work on it.

It is a good idea to coat your fingers and hands with a layer of soap and let it dry, or else use one of the hand-protecting preparations that are on the market. This will make it easier to remove the pigment—which you probably will get on your fingers no matter how careful you are.

Squeeze out a dab of the oil color on the print and, with a generous wad of cotton, spread it out evenly over the surface. Don't be afraid of getting too much: the picture detail should be covered entirely. When the print has been coated evenly, take a clean wad of cotton and, with gentle circular or straight sweeps, start picking up some of the pigment in the areas you wish to lighten. You will find it possible to wipe off all the pigment in this way, but usually you will want it removed entirely only from rather limited spots.

The exact way in which the pigment is distributed will, of course, depend on the picture. Usually it is desirable to leave the edges and corners of the print fairly dark and devoid of detail, to concentrate interest toward the center. Where it is desirable to cover unattractive detail that has no particular part in the composition of the picture, leave the pigment in a thick enough layer to accomplish this.

By careful manipulation you can build detail where none existed before. Clouds provide a good example. The original cloudless sky is generally light in tone so that, simply by wiping away pigment, you can create a realistic-looking cloud. Try to follow the shape of natural clouds, using a small wad of cotton held in the fingers or some cotton wrapped around the end of a pointed stick. After you have roughed-out the cloud form, lighten the edges and work up other detail with an artist's stump, a pointed stick having a cotton tip, or with a sharpened pencil eraser. Then, to blend the detail, rub the area lightly with a soft tuft of cotton. Cumulus-type clouds are the most popular for pictorial skies.

A pointed pencil eraser will remove all the pigment without difficulty, and is used for making fine lines and spots. As the eraser picks up color and begins to smudge, wipe it on a clean cloth. An artist's stump, normally used for such things as blending charcoal in

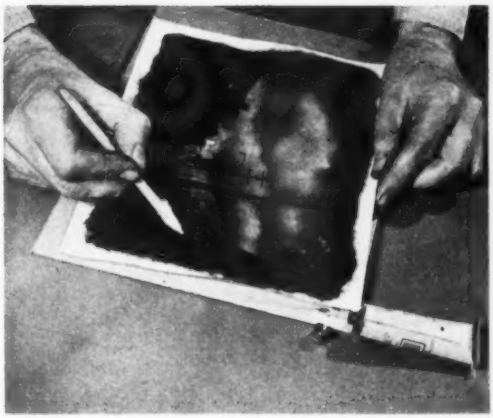
a drawing, will remove pigment less readily than an eraser. A cotton tip has about the same effect. It will take you but a short time to get the knack of using these simple tools for working-in details, removing pigment from spots or areas that are to show in their original photographic density, and for blending the pigment to prevent harsh spots and lines. Light spots in a finished print may be retouched with a cotton tip charged with pigment. After you have had some experience, you can work up a print in a half-hour or less. Contrast this with hours of work on a bromoil or similar print that may look no better.

Sometimes an interesting textural effect can be produced by rubbing the pigmented surface of a print with paper toweling or other rather coarse material. A pleasing streaked effect results, if the rubbing is in straight lines. And if the paper surface is pebbly or rough, it will add to the illusion of canvas or other texture.

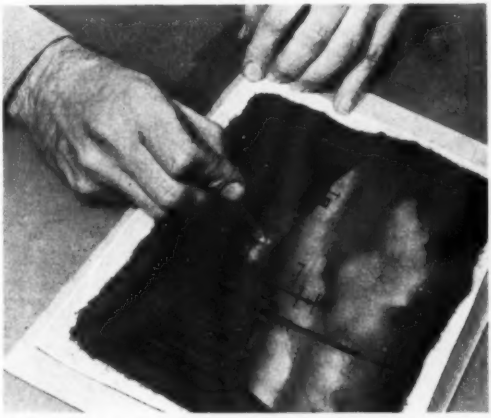
After the pigment has been worked to the desired effect, set the print aside a few days, out of the dust, to dry. When the surface is no longer tacky, it is ready for the final treatment. However, if you discover any details that should be altered, you still can work on the picture with an eraser. To protect the pigment, which may rub off if the picture is handled carelessly, spray over it a coat or two of artist's Fixatif. This is a solution of pale gums and is normally used for the purpose of fixing charcoal drawings and similar work. It is best applied with a medicine atomizer while the print is horizontal. A bottle of Fixatif sufficient for a large number of prints costs a quarter.

The oil pigment process is frequently used by photographers who make prints for salon exhibition. It may be used by anyone for producing pictures suitable for home framing. The prints, when properly made, have a rich appearance that lifts them above the average in photographs. And no two are exactly alike.

This process may be used with portraits, landscapes, and most other classes of photographs. However, it generally works best with pictures composed of fairly large masses and having a minimum of fine detail. A subject that possesses some dramatic quality is particularly suitable: by proper manipulation of the pigment to control highlights and shadows, this dramatic quality can be enhanced, particularly if the print is on matte, semi-matte or "eggshell" paper.

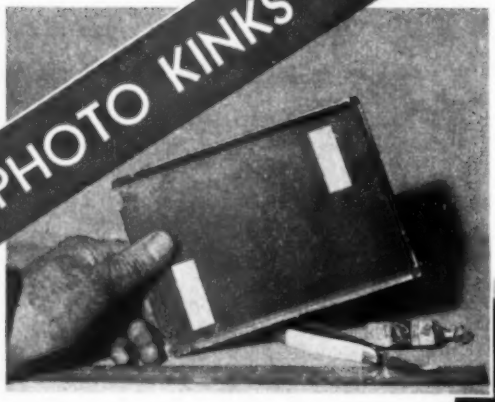


A bit of cotton wrapped around the end of a pointed stick or artist's stump can work in small, light areas.



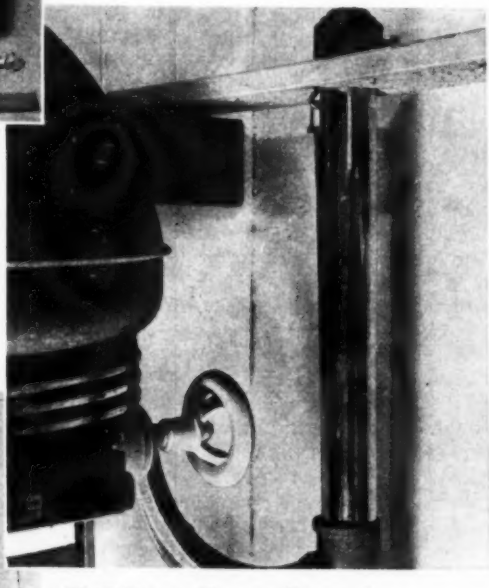
Sharpened pencil eraser is used to emphasize a highlighted portion of picture. Below: New beauty and dramatic quality in what was once an ordinary print.

PHOTO KINKS



Adapting Film Sheath

FOR a simple method of adapting 5x7 cut film sheaths to take 4x5 film, cement two strips of fairly thick cardboard to each sheath as shown, allowing a space of slightly more than 4" between them. Snap the 4x5 film lengthwise across the sheath under its turned edges and fit between cardboard stops.

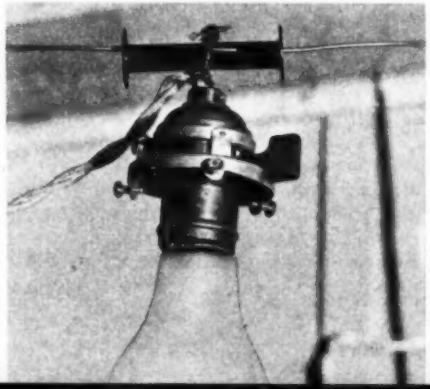


Vibration Control

TO PREVENT vibration of your enlarger post and subsequent fuzzy pictures, drill a hole, to fit your enlarger post snugly, through a piece of 1x4. Slip the piece over the post top and anchor the ends firmly to nearby walls. A corner spot on the darkroom bench is excellent.

Folding Copy Stand

THIS copy stand is hinged and folds like a collapsible ironing board. The camera is attached to a sliding carriage that runs in a groove and is locked in place with a wing nut. Hinged arms, also folding when not in use, serve as brackets for lights. Paint copy board flat black to kill all light reflection.



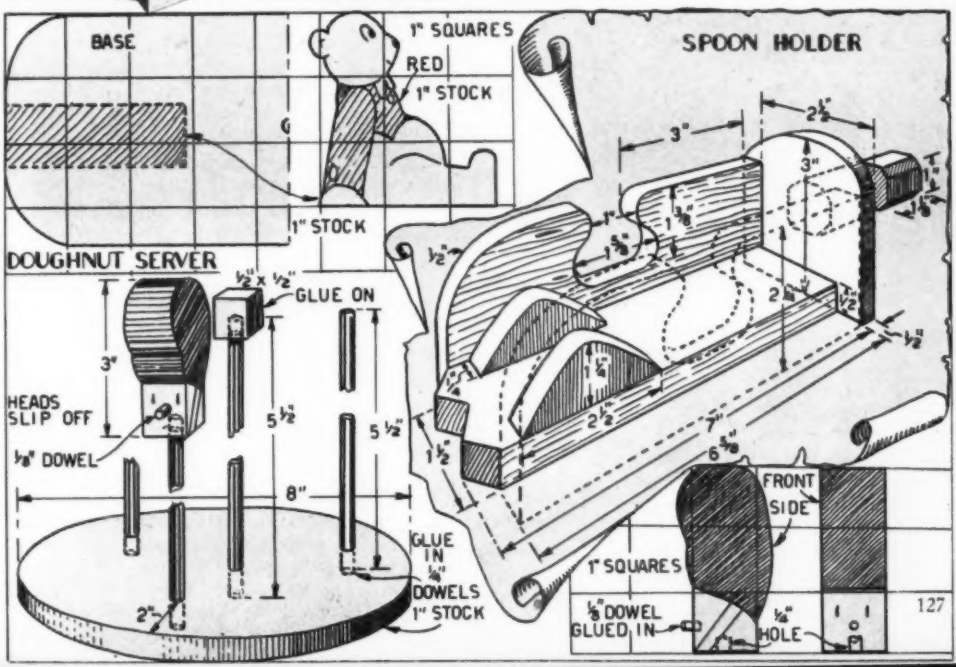
Darkroom Light

TIE or hang your darkroom light on an empty film spool and run the spool on a length of wire fastened from wall to wall near the ceiling. In this way you can slide the light along the wire from one end of the room to the other quickly and easily. Use a long extension cord and plug in near center of room, if possible.

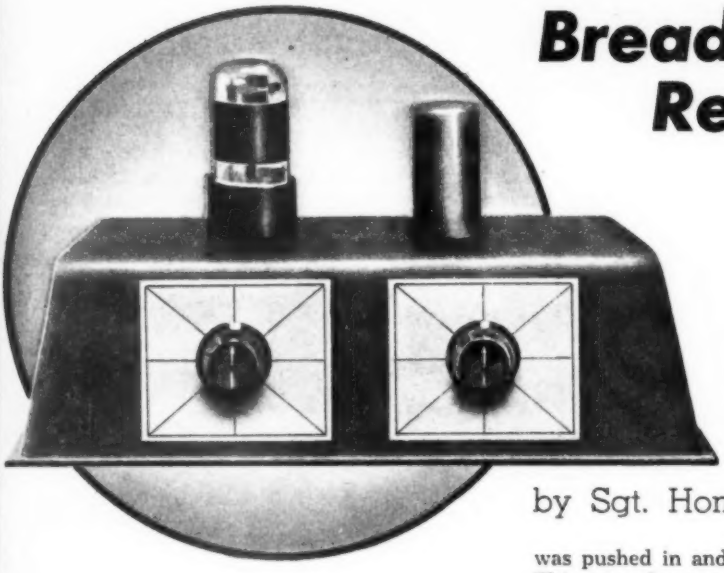
CRULLER SERVER and Spoon Rack

A CONVENIENT little scoop to hold spoons is easily made from scraps of surfaced pine. Cut the sides, 6⅝"x2¼"; the bottom 7"x1½", and the back 3"x2½", surfaced ½" stock. Assemble these sections as shown; then cut two triangular pieces 2½"x1¼" from ¼" stock and nail them to the inside in position to fit the handles of the spoons. Cut a 1⅛" section from 1"x1" stock, bevel the edges and fasten it to the back of the [*Continued on page* 140]

These three little household gadgets can be made in a few minutes on your jigsaw, using scraps of pine and a length or two of dowel for materials. Brightly enameled, they'll dress up your cocktail parties.



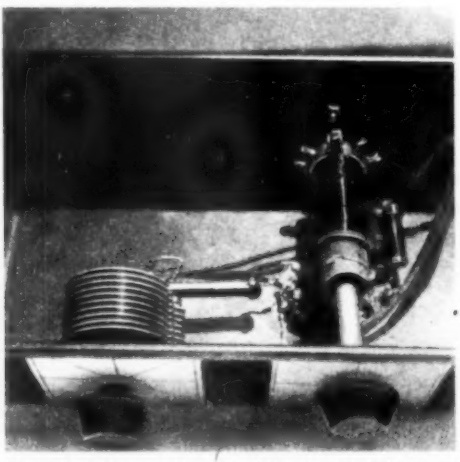
Bread Pan Receiver



Here's a simple AC regenerative receiver that will bring in nearby stations with fine volume. Covers broadcast band from 550 kc. to 1500 kc.

by Sgt. Homer F. Davidson

THIS little "bread pan" regenerative broadcast receiver contains a 117 volt heater vacuum tube (117L7-GT) and can be operated directly from the AC power line, eliminating line cord resistors. Very few parts are needed to construct this small receiver. In fact there is only one tuning condenser, home wound inductance, three resistors, and five fixed condensers. An inexpensive regeneration control was built from odds and ends. This control was a variable inductance in the tickler winding and was pushed in and out of the grid winding. This type of regeneration is smooth in operation and is not as critical as other variable components.



Variable tuning condenser and homemade inductance coil are shown above mounted in bread pan panel.

The grid coil and assembly was constructed from an old 1-inch antenna T.R.F. coil with all of the wire removed. Any 1-inch coil form will do the trick nicely if it is 3" in length. Wind 255 turns of number 36 enameled wire to match the broadcast band with the .C0014 mfd. variable condenser. To mount the coil to the chassis horizontally use a bracket ¼" wide and about 2" long.

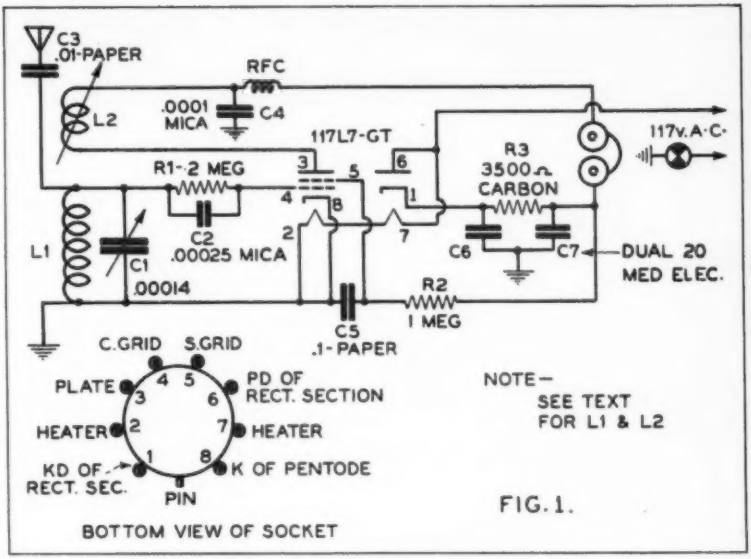
The regeneration or tickler coil was wound on ¾" diameter tubing with 40 turns of number 28 enameled wire (See Fig. 3). A controlling handle or dial was taken from ¼" wood doweling about 5" long. One end was fitted with a wooden spacer and the latter glued inside of the tickler inductance form. The remaining 4" leads of the coil ends were soldered directly to the lugs on the grid coil form before branching off into the tuning circuit, eliminating loose ends. All coil winding leads are connected directly to the grid coil lugs. This tickler coil has enough room to be varied to and fro through the grid inductance.

The grid leak resistance of two megohms and grid condenser .00025 mfds. was soldered in series with the control grid number 1 and grid inductance. Second grid number 2 or screen grid has a dropping resistance of one megohm from B+. To destroy R.F. that may exist in the screen grid circuit place a shunted .1 mfd. paper condenser to ground. (Fig. 1.)

In the plate circuit a filter network employed a radio frequency choke and one .0001 mfd. mica capacitance. The capacity bypasses all R.F. to ground while the choke offers high impedance to the radio frequency, keeping it out of the power supply. Mount this choke directly at the phone plug strip.

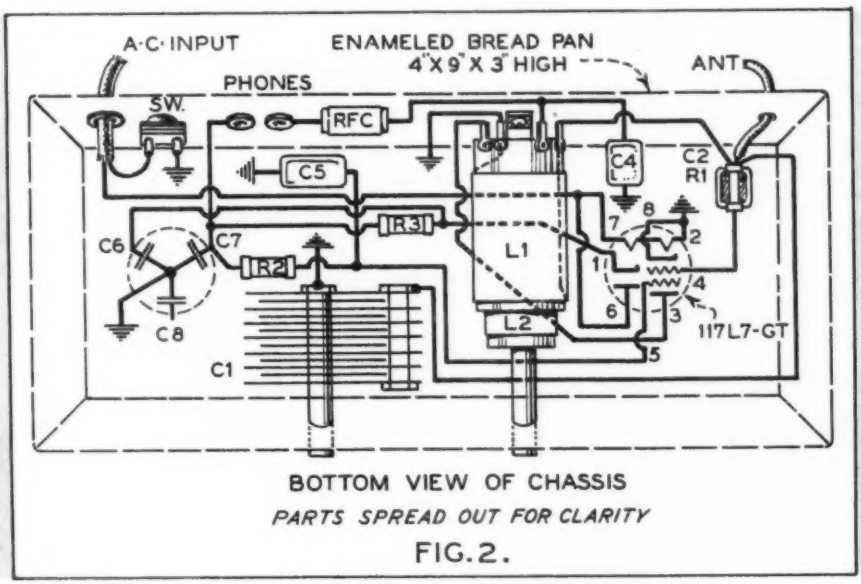
The diode section of the dual purpose 117L7-GT tube supplied plate and grid voltages for the pentode section. In the cathode circuit of the halfwave rectifier a resistance of 3500 ohms and dual 20 mfd. electrolytic are used. Another capacitance of 10 mfds. rated at 25 volts will b used for later experiments.

The hum heard in the earphones is very small and becomes somewhat more audible when regenerations occur but settles down to normal after oscillation develops.



Schematic diagram details wiring, gives parts values.

The metal chassis was constructed from a black enameled cake pan. Overall dimensions were 4" wide, 9" in length, and 3" deep. Starting with the octal tube base socket and electrolytic can draw a straight line down the middle of the chassis and space them 2" apart. The socket is inserted, mounting holes



Lay out the parts on bread pan chassis like this.

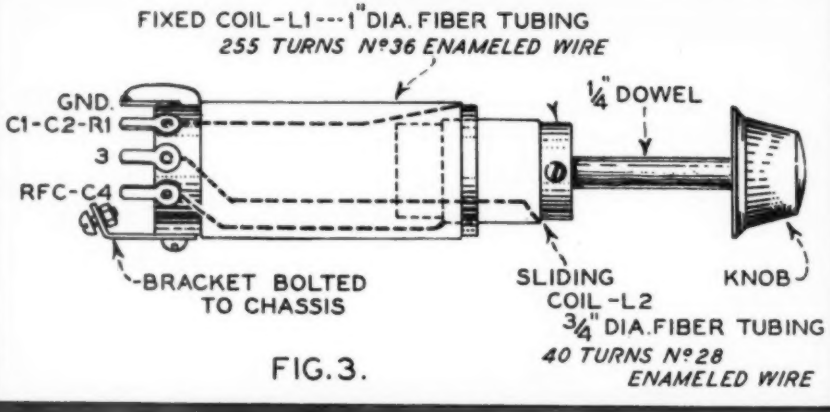
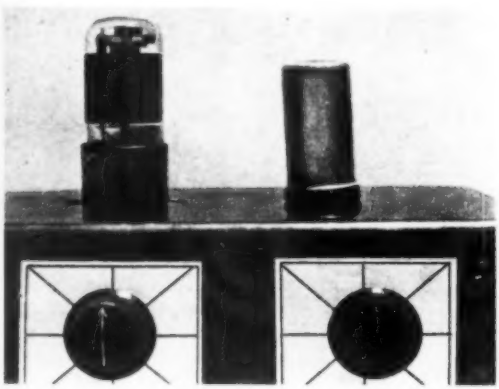


FIG. 3.

Grid coil and regeneration coil are wound on 1-inch and ¾-inch forms, respectively. Latter is sliding.

marked and drilled. In the front panel two holes are drilled for the regeneration control and tuning condenser. These holes are ⅜" in diameter. A ⅜" hole is also placed in the rear panel, to the right-hand side, for the AC on and off switch. Drill two holes for the headphone jacks about 1" apart and 1" from the AC switch. Also drill one ¼" hole for the AC cord and ⅛" hole for the antenna lead in wire.

These holes should all be drilled before the receiver parts are assembled. Now mount the octal tube sockets, phone jacks, tuning condenser, electroylic condenser, and solenoid coil (Fig. 2). All other condensers and small resistors can be mounted while wiring the receiver circuit. All ground connections are made above ground at a common lug.



Closeup of set shows 117L7-GT tube and rectifier mounted on bottom (becomes top) of b.p. chassis.

To insure good soldering joints the connecting wires should be cleaned, tinned, and wrapped tightly around the connection. Then squeeze with a pair of long nose pliers. We now have a good mechanical connection. The contacts to be soldered must be cleaned, then apply flux and solder. This connection will not corrode if proper core solder is used. Do not use acid core for electrical wiring—resin core is better. Do not use too much solder on the joints.

As you probably know, a regenerative receiver is very simple to operate, with very little explanation. After all connections have been gone over several times to insure that good contacts have been made the AC cord can be inserted into the line receptacle. You can observe if the 117L7-GT vacuum tube is heating up by looking down upon the top end of the tube. A red light appears. Hum should exist in the headphones. The antenna is now connected through .1 mfd. paper condenser. If the antenna should become grounded at any time this condenser eliminates burning out of the grid inductance. because when the AC plug is inserted the hot side of the line may be on the grounded chassis end. In this case 117 volts would appear across the grid coil, burning it out.

The regeneration coil should be pushed all the way in to rotate the variable condenser. Whistles occur [*Continued on page* 138]

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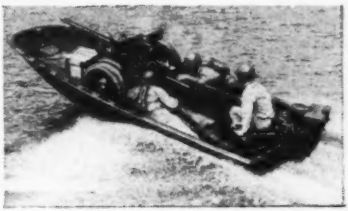

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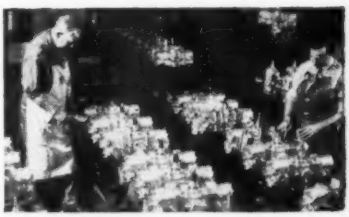

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Model Steam Engine

[*Continued from page 89*]

exact diameter, using the cylinder bore as a ring gage. Turn the oil grooves, drill the hole for the piston rod and cut the work off. The piston rod is made up from drillrod, threaded on one end, shouldered down slightly on the other and riveted to the piston. The finished job is shown, along with other parts, in Fig. 8.

The cross head slide, also shown in Fig. 8, was made up from a small block of brass accurately cut to the dimensions indicated in the drawings. The square grooves for the guide bars can be cut in the shaper or milling attachment of the lathe. These should fit snugly between the guide bars, just freely enough to slide easily but without the slightest bit of play. The connecting rod, shown in the same photo, was turned from flat steel bar stock. It was drilled for the cross head pin on one end and the crankpin on the other. When finally brought to shape by hand filing the connecting rod was pinned to the cross head guide and was ready for assembly.

The piston type valve, with all its working gear is a precision job. Much of the engine's performance will depend on just how well the machine work on these parts is accomplished. The valve chamber drawings should be studied and thoroughly understood before work is started on this part. It is turned to shape from a short length of bronze bar, the barrel being a driving fit in the cylinder block. The cylinder bore for the piston valve should be drilled and reamed at the same time the outer diameter is turned. The long exhaust port slot, on the outside of the shell, can be milled with a fine end mill with the work held in the milling attachment of the lathe. The ports on each end of the slot are first drilled through the cylinder wall and connected by the slot, the depth of which should be very carefully watched while milling to avoid cutting too close to the cylinder bore. Steam ports on the opposite side of the chamber can then be drilled, first with a number 30 drill, then counterbored slightly with a $\frac{1}{16}$" drill. The counterbore guarantees that the steam ports in the valve chamber will line up with, and allow free passage of, steam through the ports in the cylinder block. The completed valve chamber is shown in Fig. 11 along with the finished cylinder block, while in Fig. 12 it is pressed permanently in place.

The piston valve, shown with other parts in Fig. 13, is made up from drill rod to the dimensions in the drawings. This is best turned accurately to size while held in the collet attachment, where the fine oil grooves are cut in with a sharp pointed tool bit. The lower end is drilled and tapped to receive the valve rod, this being done with a number 42 drill and 4-48 tap.

The valve rod is made up in two parts. The smaller one, acting as a connecting rod joint, is screwed into the lower end of the piston valve and held firmly in place, with a lock-nut, after

[*Continued on page 142*]

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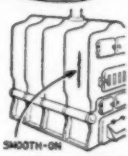

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Boy's Workbench

[*Continued from page 95*]

The holes should provide a driving fit for the legs, and as added anchorage use the old, reliable wedge-in-sawcut method, also illustrated.

The Box, which, between work sessions provides storage space for unfinished projects, is equipped with a tool rack and with six "pockets" for additional tools, boxes of nails or screws, or for cans of paint or glue and other material. The box is dovetailed and dadoed together and is glued up under pressure provided by nails, which can be left in place. The top is dadoed into grooves located about ½" below the top edges of the sides.

Houn' Dawg Bookends

[*Continued from page 96*]

might be cut separately and tapered down at upper end to gradually disappear at the eyes. If done in this manner, use small round-head black pin for nose.

After completing figures, proceed with bases, which are cut from standard 1" lumber (¾" dressed) and stained maple. Cut three steps in top of back on each side, ½"x1½" each, and bevel base piece to within ½" of back on either side and front. Finish with stain and several coats of shellac. Bases may be loaded as sketched.

The figures are now held in their proper positions and the location of the hole for dowel is determined by measuring height of hole in figures from base and locating same on the back piece. A piece of ⅛" dowel may be grooved with a file slightly to stimulate rope.

The fire plug may be turned from a piece of 1" dowel or built up from a piece of ⅞" dowel by rounding one end and making a wide and a narrow collar of cardboard to shape it as shown. Short lengths of $\frac{3}{16}$" dowels form spigots. O. A. length—2¾".

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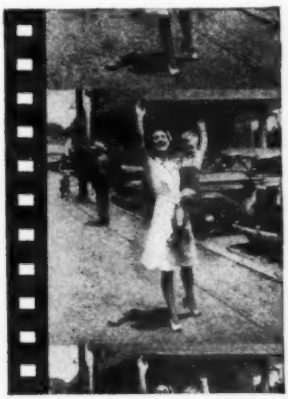

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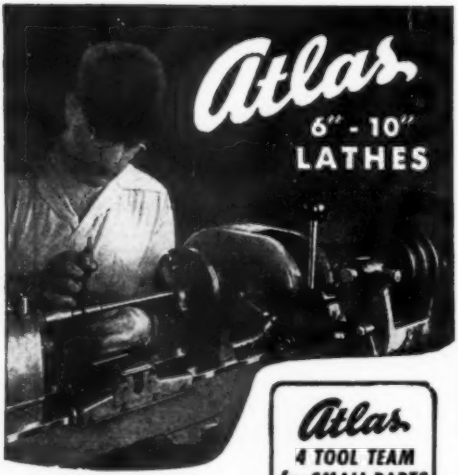

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Housecar For Postwar Travel

[*Continued from page* 99]

a waterproof or Marine grade only should be used, and is difficult to secure now. Eighth-inch Masonite left bare would be satisfactory, or any thin light-weight composition sheathing material. Cypress, ¼" to ⅜" thick, in up to 12" boards (boxing), can, in some places be secured at a low price. If used, it can be covered with thin fabric set in paint; it makes a cheap, sturdy construction job.

Whatever is used for sheathing should be well fastened to the entire framework to give the house added strength; perhaps with small nails or flathead screws spaced on about 4" centers. The easiest way to cover the framework is to lay the roof first, then the slats over the rounded sections, and finally sheathing over the sides and ends, allowing this to run slightly over door and window openings for sawing flush. At the cab end outer sheathing need merely be brought neatly up to it. To join cab to house, a few inches of top fabric should be left when cutting away the after end of the car. This can be brought up over the house sheathing in cement or heavy paint, and secured neatly with ½" screw-fastened strips.

Ideas For Service Men

[*Continued from page* 107]

"Do you want to look busy and actually take it easy? I'll tell you how. The next time you find a lot of detail floating around camp, pick up a mop and an empty bucket and just walk around your area. Any non-com who has a detail on his mind would never think of stopping you. Try it sometime.

"Here's a corker, fellows. Go up on sick call and tell the Medics that you sprained your back lifting a crate or some other heavy object. Tell them that it hurts badly when you try to bend down. The Docs will look you over and give you a T. S. slip excusing you from heavy duty. What more can you ask?

"By the way, if you should get a scratch on your hand, just increase the size of the band aid about 10 times, and no kind hearted Sarge will expect too much of you.

"Those are my suggestions for a new angle for your column, 'Ideas for Service Men.' Don't take me seriously and don't think that I'm a goldbricker. I'm not! Besides, my suggestions seldom worked when I tried them.

Pvt. Nick Yaciuk,
Camp Rucker, Ala."

Editor's note: Any opinions expressed in the foregoing are strictly those of the author, and do not necessarily reflect the views of this magazine!

The only Australian boomerangs designed to return when thrown were those made for hunting.

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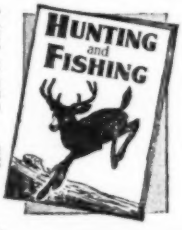
is a monthly magazine crammed full of hunting, fishing, camping, dog and boating stories and pictures, invaluable information about guns, fishing tackle, game law changes, best places to fish and hunt — countless ideas that will add more fun to your days afield.



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How To Make A Plastic Box

[*Continued from page* 115]

The advantage of a transparent material over an opaque one is obvious; you can see through it. There is, on the other hand, a great disadvantage, though, particularly for the lazy bones among us: the business of inside polish. That's a pretty tough proposition and takes time and patience. But there's another trick you can do, if you don't insist on complete visibility. If you sandpaper the inside of your container either by hand or with a small sanding drum on your lathe, you'll get a lovely finish . . . very much like sandblasted glass . . . on the inside, and you'll still have the effect of transparent material and the play of light and shade on it, which give a Plexiglas or Lucite piece its attraction.

Pipe Dream

[*Continued from page* 117]

(Three on 1 side and 2 alternated on opposite side.) For pipe seams fit a cross pipe ⅜"x1⅜"x-5½" in the pipe section, in slides fastened to the end pieces. Groove it out to fit over the pipe stems to hold pipes in place when box is closed.

The original box is made of white pine, varnished and rubbed with oil and pumice stone, the inside treated with oil.

The top design on your box is entirely up to you. The one on this particular example, is: Two lines scored by molding cutter 1" from side and ends and ¼" apart; monogram in center of top made with wood burning pen.

Doghouse For Your Boat

[*Continued from page* 116]

to the sides is to allow its covering material to project beyond the framing, a distance equal to the thickness of the made-up sides (about 1¼"), to permit screw fastening to forward edges of sides.

Low-priced barn sash, around 20" x 30" in size, can be used for windows, two either side and one forward.

Bread Pan Receiver

[*Continued from page* 130]

in the headphones indicating broadcast signals. Pull the regeneration control out until the station burst into the clear. Minor adjustments can be made for larger or smaller volume with this control. If the receiver does not oscillate, reverse the two tickler windings and the following tuning manner repeated as before.

The antenna used was a single inverted L about 25' long and 15' above the earth surface. A longer aerial will produce better results although stations clouded the dial from one end to the other.

"WITH THE WIND BLOWING MY HAIR AND SINGING A SONG IN MY EARS"

"I was in Alaska over a year — am now somewhere in the Aleutians. The Harley-Davidsons here are doing praiseworthy work and giving faithful service. It's good your machines are made to stand hard punishment. I long to be back in the saddle of my own faithful Harley-Davidson again — *with the wind blowing my hair and singing a song in my ears.*"

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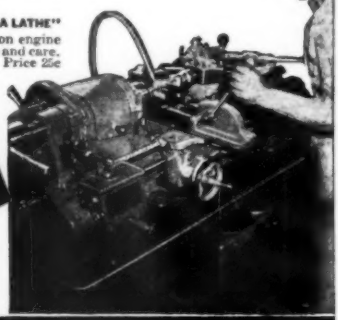

Series 1086 South Bend Precision Turret Lathe

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Lathe Boring Table

[*Continued from page* 120]

table top, the exact center is located and mounted in the four-jaw chuck, where the hole for the clamping lug is drilled and bored. Five holes for the strap clamp-screws are drilled in each end and tapped ¼"-20. Other holes can be drilled later to fit the job at hand.

The clamping lug is next turned to shape, making it an exact duplicate of the one which holds the compound rest in place. Enough extra length should be allowed on the shaft for riveting it in place. The table is then mounted in the three-jaw chuck, held by the clamping lug, and a light facing cut taken over the riveted shaft end, accurately smoothing the table top for firmly clamping the work in place.—*C. W. Woodson.*

Cruller Server And Rack

[*Continued from page* 127]

scoop with small screws. Finish the article the natural color of the wood and paint two wavy lines across each side.

To make the holder for one stack of doughnuts, first saw the base 9"x3½" from 1" surfaced stock, round the corners and drill a ¼" hole through the center. Glue into this center hole a ¼" section of dowel 10" long. Trace the little bear to 1" stock and jigsaw out two. Fasten one to each end of the server. Finish the base the natural color of the wood, stain the figures walnut, paint the figure's coat red or yellow, the outlines black, and add a touch of white to the eyes.

For the holder of three stacks of doughnuts, cut a disk 8" in diameter from 1" stock, drill a ¼" hole in the center and three ¼" holes equally spaced each 2" in from the edge. Glue a 5½" section of ¼" dowel into each of these holes. Cut a ½"x½" piece, drill a ¼" hole ¼" deep into the bottom and glue it on the center dowel for a handle; then trace three soldier heads, as shown in the squared drawing, to 1" stock; jigsaw them out, glue short sections of ⅛" dowel in for noses. Drill ¼" holes ¼" deep into the bottom of these heads. They must slip on and off of the three dowels. Slip your doughnuts over the dowels and set the heads on; then take a head off when a doughnut is removed.

A synthetic rubber sponge has been developed that will stay soft and compressible at 40 degrees below zero Fahrenheit.

In 1941, cheese made in factories in the United States totaled nearly 1,000,000,000 pounds, about half of which was made in Wisconsin.

Saccharine, an organic chemical without food value, costs normally about $1.50 a pound; the sweetening power of a pound is equivalent, however, to about $27.50 worth of sugar.

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First Prize . . . .$500 in War Bonds
Second Prize . .$200 in War Bonds
Third Prize. . . .$100 in War Bonds
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Send X-ACTO checked. ☐ Enclosed find $.....
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Model Steam Engine

[*Continued from page* 132]

properly setting the valve. The threaded portion of this valve rod is turned to exactly .112 in diameter and the threads cut with a 4-48 die for a distance of 5/8". The valve rod proper is made from 1/4" square steel rod, turned to 1/8" diameter for most of its length and threaded 5-40 on one end for fastening to the eccentric ring. The big end is filed to shape as indicated in the drawings, and carefully fitted to the smaller valve rod. The joint of the two parts, when drilled and pinned together, should work freely without the slightest trace of shake.

The eccentric and eccentric sheave, also shown in Fig. 13, are simple lathe jobs. They can be turned complete in the three-jaw chuck. Both the eccentric and eccentric cap are made up from the same short length of 1" steel bar stock, chucked as in Fig. 14. A piece of 3/16" flat steel under one of the jaws offsets the work the exact amount necessary to give the eccentric the proper throw. The photo shows the eccentric cap turned to shape, with the shaft hole drilled clear through and reamed for re-chucking without the flat steel bar under the one jaw. This will allow the outer diameter of the steel bar to run true. The eccentric cap can be cut off, reversed in the chuck and smoothly faced to the proper thickness. The set-screw hole in the collar should be drilled and tapped for fastening the eccentric to the crankshaft. The eccentric body can now be made from the remaining piece of stock. This has the shaft hole drilled off center exactly the same distance as the eccentric cap. The piece is chucked so that the outer diameter runs true. Step or shoulder is turned to the dimensions in the drawings and then cut off, reversed in the chuck and smoothly faced to proper thickness.

The eccentric ring is made up from a short piece of brass rod turned to exact diameter and bored for a snug fit on the eccentric body. Cut the part off, reverse in the chuck and face to exact thickness-one or two thousandths less than the heighth of the shoulder on the eccentric body. The hole to receive the valve rod is drilled through the rim of the sheave with a number 38 drill and tapped 5-40.

The two eccentric parts are slipped onto a mandrel, lined up in proper position and a number 38 hole drilled through both parts for the screw which fastens them together. The hole in the cap is opened out with a 1/8" drill to clear the screw while the hole in the body is tapped 5-40. With the eccentric ring in place the two parts can be fastened together and the completed eccentric is ready for mounting on the crankshaft. This about completes the parts for the engine proper, leaving only the steam valve, two petcocks and the lubricator to be turned out. These parts are made from brass rod both round and hexagon and are simple lathe jobs.

The lubricator is made up from a number of

[*Continued on page* 144]

"You'll Go Places On This Team!"

1st Lt. Richard J. Niederriter, pilot, 1st Lt. Richard A. Carocari, navigator, Sgt. Richard W. Evans, tail-gunner, and 1st Lt. Lester A. Darst, bombardier, (left to right in foreground above) have hit most of Germany's "hot spots" in their Flying Fortress, the "Winsome Winn." Asked which was their most exciting mission, their answer was unanimous: "Anklam!"

"You probably never heard of Anklam," Lt. Carocari said. "Before the war it was just a little jerk-water town a hundred miles or so from Berlin. But the Nazis built a Focke-Wulf assembly plant there. And our assignment was to flatten it.

"I plotted my course for Berlin, to make Jerry think that was where we were heading. And we hadn't any more than crossed Denmark until the reception committee buzzed out to meet us. At least 300 German fighters hit our flight. They'd come barreling in from all directions at once . . . the fire from their cannons and machine guns making a solid sheet of flame along their wings. The going was hot and heavy for awhile."

"Hot and heavy is right," Lt. Niederriter said. "We were under fire for 3½ hours. But our gunners were too smart—and too good—for them. Evans here had his tail-gun knocked out, so he came up and fired the flexible gun in the nose. When the ball-turret got fouled up with oil from a damaged line, the ball-gunner adjusted it so it would keep revolving—to fool the fighters—and then he climbed out and lent a hand at the waist-guns. It was the prettiest piece of teamwork I've ever seen."

"That's what really licked 'em," Sgt. Evans said. "Teamwork! Lt. Niederriter had his hands full keeping the *Winsome Winn* on her course . . . yet all the time, he sat up there and called the shots for us gunners. We sure did work those German fighters over. We saw two blow up in mid-air."

"Finally," Lt. Darst said, "we changed our course and cut for Anklam. The F-W's gave us a breathing spell as we swung in over the town and we made a nice, smooth bombing run. I saw our eggs land square on that factory. And, brother, did we plaster it! They won't make fighter planes there very soon again!"

Lt. Niederriter grinned. "Sure," he said, "you go plenty of places in the AAF. And it's not exactly joy-riding, either. But we've got a job to do. And we work *together* to do it.

"And I think that's the important thing for any young fellow—who wants to win his wings as Gunner, Bombardier, Navigator, or Pilot—to remember . . .

"You're on a *team* in the AAF—from the time you step into your first training plane until you get up there in action. And it's a winning team . . . an unbeatable team . . . the 'greatest team in the world'!"

U. S. ARMY RECRUITING SERVICE

"They came barreling in from all directions."

MEN OF 17 . . .

If you want to fly on the "greatest team in the world," an AAF air combat crew . . . go to your nearest AAF Examining Board . . . see if you can qualify for the Air Corps Enlisted Reserve. If you qualify, you will receive this insignia . . . but will not be called for training until you are 18 or over.

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For pre-aviation training, see your local Civil Air Patrol officers. Also see your High School principal or adviser about recommended courses in the Air Service Division of the High School Victory Corps. Ask about the opportunities for college training through the Army Specialized Training Reserve Program.

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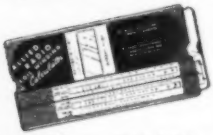

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SUPERIOR PAINT AND VARNISH WORKS
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Model Steam Engine

[*Continued from page* 142]

pieces. Body is turned from solid rod and drilled for a cross member to be driven and soldered in place. This is clearly shown in Fig. 15 and 16 and also in the drawings, along with complete dimensions. The filler cap is also turned from solid rod and threaded to screw into the lubricator shell. It is drilled on top for a cross bar to aid in screwing it tightly in place. The needle valve and drain valve are also made up from bar stock, closely following the dimensions in the drawings and threaded to fit their respective parts in the lubricator shell.

The steam valve is turned from hexagon rod, drilled and threaded for the needle valve and packing nut on one end and turned for a snug fit into the steam pipe collar on the other. The end projecting beyond the collar is threaded to screw into the cylinder block, holding the steam pipe collar tightly in place. These two completed parts are shown in Figs. 16 and 17.

The two petcocks, to drain condensed steam from the cylinder, are also made from hexagon rod, drilled and threaded for the valve stem with escape holes located as shown. These, too, are threaded on their shank for screwing into the cylinder block. They are shown along with the steam valve in Fig. 17.

With all these parts in place, the balance of the engine assembled and the moving parts working smoothly with no trace of binding anywhere, the eccentric can be adjusted to properly operate the valve for a tryout under steam. With the piston at top dead center the valve should be adjusted until it just begins to crack open. The same valve action must take place on the return stroke with the piston at lower dead center. This will require adjusting the length of the valve rod as well as the position of the eccentric on the crankshaft.

With a few trys the valve can be adjusted until the engine turns over under air pressure with the exhaust sounding out an even beat.

For the engine's first tryout under steam, oil all moving parts well and fill the lubricator with heavy motor oil. This will lubricate the cylinder, piston and valve as the condensed steam turns to water drop by drop and settles to the bottom of the lubricator shell, displacing the oil. The latter will slowly feed through the cylinder and piston valve chamber, keeping the inaccessible parts well covered with a film of oil, adding compression as well as power and speed to the little engine as it is given its initial break-in run under steam.

MECHANIX ILLUSTRATED conducts a blueprint service for the benefit of its readers. Send in a three-cent stamp for a FREE catalogue.

Jungle Headwork

[*Continued from page 54*]

each one of the hairs must be carefully grown to the right length, weaved and knotted in its proper place, and daily tended and trimmed. Again, it's a question of much time and of idleness, of no hard work and of many servants, and therefore of affluence and aristocracy.

But there is another point to this mania for a long head, the one that gives so much importance to this general practice of the Mangbetu: the influence that this cruel-appearing form of plastic surgery exercises upon their whole existence.

Months and months of such manipulations of the skull—and therefore of the brain—of a child, from the day the baby is born until the first birthday, would seem enough to make an idiot, a moron, or an invalid out of him. Instead, there is no doubt that the Mangbetu are miles ahead of any other Bantu race of Central Africa in intelligence, in enterprise, in artistic accomplishments, and in good health, longevity, and fertility.

This is the case for King Ekibondo's immense family as well as for dozens of others which I have visited and studied. The Belgians, a score of years ago, tried to stop this custom which missionaries and doctors alike denounced as an intolerable survival of barbarism.

And you know what happened? After six years the Belgian authorities had hastily to revoke their ban, because 60 per cent of the children born during that period, whose heads had not been manipulated in the usual Mangbetu manner, grew up to be idiots!

A Dutch doctor who had been in the country since its final occupation by the Belgians talked to us at length about this phenomenon. Despite his many years of researches, however, he seemed not yet to have reached definite conclusions.

"You see," he told us. "I was one of the first to clamor against this custom. But I was also the very first to ask that it be allowed again, after those disastrous six years. Since then, the usual percentage of halfwits has again dropped down to less than one percent, and every mission reports that the longheaded children are by far the best pupils in their schools.

"Why," he went on, "even in the English language this phenomenon is recognized, or at least implied. Look in the Roget's *Thesaurus*, for instance. Among the synonyms for intelligence you will find sagacity, keenness, perspicacity, cunning—and *'longheadedness.'* It must be that in ancient times someone had accidentally stumbled upon the observation that there existed a connection between the length of one's cranium and the development of one's intelligence!"

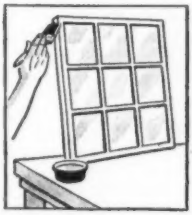
I've sometimes wished that my parents had squeezed my own skull—the Mangbetu way.

Fertilized ponds in one experiment supported four to five times as great a weight of fish as unfertilized waters.

WORKSHOP WISDOM

How to make windows slide easily

To end the annoyance of sticking windows and drawers, follow these easy directions:—



1. Clean off any excess paint . . . sandpaper smooth all sliding surfaces.

2. Apply a thin coat of Cascamite to these surfaces. Let dry and sandpaper again lightly.

3. Rub frames with paraffin or wax candle.

Cascamite will sink into the wood pores, harden, and help prevent future swelling or sticking.

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CASCAMITE

Plastic Adhesive

Preview Of Plastics

[*Continued from page 82*]

sections as well as other functional Plexiglas interparts; of course post-war private planes will use Plexiglas for full view canopes and we envision hundreds of other uses in the fields of architecture, controlled interior and exterior lighting, etc.

The cast resins which we know under names such as Catalin, Bakelite cast resins, Marblette, etc., are excellent for machining and can be handled on any standard tool equipment. Articles made from them such as jewelry, belt buckles, handles and thousands of others can be mass produced in very much the same way as things of metals are mass produced. But acetates like Lumarith and Tenite are machineable too. Both groups have an unlimited range of color; or can be transparent or translucent. In normal times any craftsman can go to the companies that produce them and buy sheets, rods and tubes out of which anything can be made that ingenuity and taste can create in the smallest and in the largest scale of production.

There is yet another important angle to all this. It is the combination of plastics with other materials, and this gives us some of the brightest pictures for the future. We mentioned plasticising before, and laminating. A piece of plywood is put through a plasticising process . . . low- or no-pressure molding is applied here, and the new science of electronics has a good deal to do with it since electronic currents do the fusing between the wood and the plastic resins . . . you'll get something which is almost as hard as steel and as unbreakable. Yet it retains the grain and the beauty of the natural wood. Or a piece of canvas can have plastic coatings applied to it to make seat covers which do not wear out, yet have whatever texture and color and design desired. Heavy duck coated with resin compounds created non-rubber pontoons for war.

Metals and Plastics are going to work together too. The armed forces, are now getting their powdered coffee rations in moisture proof aluminum foil coated with cellusoic sheet. They are unaffected by rough handling and extremes of temperature. Dehydrated food of the future will be packed this way.

Illustrations for this article through courtesy of following: Tennessee Eastman Corp., pps. 70, 71, 72, 74, 75, 77, 78, 79, 82; Dupont de Nemours, 68; Rohm & Haas Co., 69, 81; Catalin Corp., 73, 74, 80; Dow Chemical Co., 69; Durez Plastics & Chemicals, Inc., 76, 77.

California plant scientists say that no one knows how many varieties of figs are being grown in the world.

Over half the iron ore produced in the Soviet Union comes from the Ukraine mines, but output elsewhere is increasing.

Cycles Predict The Future

[*Continued from page 51*]

seemingly by cool era types of human conduct. The present war may break down into bloody civil wars as revived democracy strives to establish governments respecting the individual. Chaos, rebellion, and bloody battles between national factions may make "peace", for a time, as devastating as war. The beginnings are discernible in Italy, Greece, Yugoslavia, even France, where national factions fight each other instead of a common enemy. This is entirely in accord with the present phase of the cycle.

There is also the possibility—though by no means the certainty— of another world war in the 1950's. A short intervening warm cycle anticipated for that time may set the stage for international conflict. It may, indeed, be a war to tie up loose ends left by the present one.

Apparently we are in the throes of a breakdown of the great culture period which, centering on 1470 and the Renaissance, marked the beginning of the modern world. The 510-year cycle should next center upon 1980, whereupon, in the words of Dr. Wheeler, "the modern world, *dressed in new clothes*, seems destined to last for another 500 years after a thorough overhauling and after many radical changes are made for which this century will pave the way."

Right now the idea of One World, in which all nations shall adjust their political and economic differences amicably without recourse to war, has taken firm hold on human imaginations. It is fervently to be hoped that something like a world state will develop out of the present war, but the timing of the cycles discourages easy optimism. The projected date for the ideal World State is sometime after the 25th century.

Here it is the 1,020-year cycle which gives the timing. This rhythm (made up of two 510-year cycles) terminates in a cold drought period which marks exceptionally profound cultural changes. The collapse of the ancient world, including the fall of Rome, occurred in the middle of the fifth century, the collapse of medieval culture in the fifteenth century—and the collapse of a new culture, not yet in existence, may be predicted for the 25th century. The collapse which we now are apparently experiencing is a milder, intervening (510-year) breakdown, but more vital to us because we are living through it.

Dr. Wheeler states: "I look for tremendous changes to occur during the remainder of the century and for a great revival and renaissance near the opening of the next century, probably 2010. It will be during the first half of the next 510-year rhythm that the modern world will reach the climax of its development (the 21st and 22nd centuries). This culture will go through a period of decline and collapse in the 25th century in which a more complete breakdown will occur, comparable to the transition between the medie-

[*Continued on page 148*]

Clearing Invasion Harbors

[*Continued from page 48*]

tons. On the bow is a cathead which will lift 40 tons. Mounted on the foremast are four 10-ton booms and one 30-ton boom, each with a power winch. As part of the salvage equipment the ship carries a 21 unit ponton system. Each unit is a steel tank five by seven by seven feet. When bolted together the pontons have a lifting capacity of 50 tons and may also be used as a barge.

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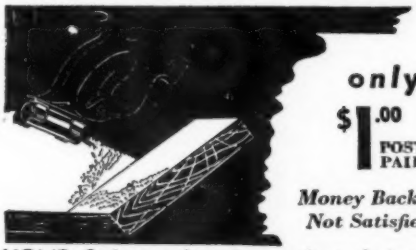

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Cycles Predict The Future

[*Continued from page* 146]

val and the modern world. The scope of these expected changes defies imagination.

After 1980 there is a prospect of great nation-building wars. The new 510-year rhythm then beginning starts with climatic shifts from cold and dry to warm and wet—a period which has always in the past brought major international wars.

These, as Dr. Wheeler points out, are not necessarily inevitable. "To prevent a recurrence of these wars, the leading nations of today must form a sufficiently solid and stable confederation to insure world peace, or else the energy of the next nation-building epoch will spill over into wars of such intensity as to wreck the new civilization due at that time. In other words, the development of the new civilization is not inevitable; we can spoil it through mismanagement and error."

If, as seems highly probable, the present war in Europe breaks down into bloody civil wars and rebellions, as the typical cool-era democracy fights to establish republics and governments giving more power to the masses, what is in store for our own country? No overthrow of government is in prospect, for we are already democratic. But there are serious clashes in store between various groups within the country. Minorities will tend to become bolder, more arrogant.

There is every probability that we will have labor strife on an unprecedented scale. Strikes, race riots, demands for extension of privileges will become more common. Emphasis on rights of the individual will become so pronounced that conditions will be chaotic for some time.

This emphasis implies a trend away from strong, centralized government—not toward more and more government regulation, which in these days of war seems more to be expected. The trend is also to the right, away from socialism and communism, for though social gains will be maintained and extended, this will be accomplished with a minimum of state control. Economically, rugged individualism forecasts less government in business, cut-throat competition, lowering prices, free trade and more little businesses run by their owners.

At the same time, weakened central government sets the stage for local boss rule, and creates conditions favorable to vigilante committees and similar groups, taking government into their own hands to control or suppress troublesome minorities and racial groups.

With the individual increasingly important, educational systems will become more widespread and free to all. Indeed, this can be foreseen from the college subsidy programs already planned by the army for discharged veterans. But the development has always been typical of cool-era democracy which, being practical and materialistic rather than reflective and philosophical,

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Cycles Predict The Future

[*Continued from page* 148]

emphasizes science and mathematics at the expense of social studies.

A tremendous factor brought into the international picture by the cyclical swing to cooler times is the increasing importance of Oriental and warm country peoples—Mohammedans, Hindus, the people of Turkey and India and North Africa and China. They may be expected to become more energetic, more democratic and industrialized in the cold phase. And their influence on the new world may well be tremendous.

Again, cycles show that such influence has recurred rhythmically in the past. Curiously, Europe and Asia have alternated in dominance every 510 years. Europe's cycle ran from 670 to 60 B. C.; this was the era of Greece and the Ptolemies, and the main stage in the development of the real strength of Rome. The pendulum swung to Asia from 60 B.C. to 450 A.D.; Rome steadily declined and while no other great empires were formed in the West, several were formed in the East.

The next 500-odd years were Europe's; from 450 to 960 saw the dominance of the Greek empire, Justinian, Charlemagne, growth of Great Britain. Then came Asia, from 960 to 1470; no great empire developed in Europe but in Asia there was Genghis Khan, Kublai Khan, the Turks, African civilizations at their height. The era now breaking down (1470 to 1980) has been Europe's and the United States', as we seem to follow Europe.

What of the next cycle—1980 to 2490? Will it be Asia's? Will Europe and the U. S. quiet down and become second rate in vitality?

The disturbing possibility is there. The world easily can be made over in 500 years! Industrialization, and cooler climates bestowing the energy to apply it, may well give Asia's tremendous manpower the tools to outstrip us.

Much of the future foretold by cycles is the problem of our children's children. But many of us will live through exciting eras. It would be wishful thinking to expect that this is the last war. If we escape another war in the 1950's, we will at least participate in others before the ideal world civilization is established.

And we should be prepared for turbulent times ahead—bloody civil strife in totalitarian countries that will complicate our problems of victory, and the kind of chaos in our own country that results from individuals and minorities becoming more and more belligerent. It is going to take a long, troublesome time getting "back to normal"—but when we do, probably some time after 1980, the "forgotten man" seems destined to be the best-remembered person on the globe.

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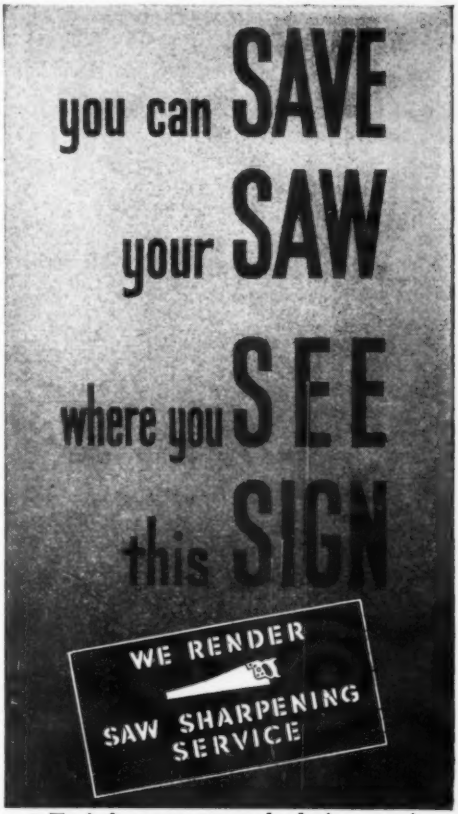

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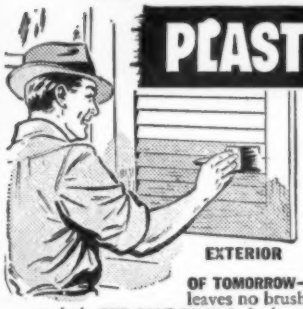

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